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ABSTRACT SECTION

☞ New readers are reminded of the *Guide to the use of Forestry Abstracts* which will enable them to get the maximum value from the *Abstracts*—see inside back cover. Brief extracts from this publication are reproduced on the *Readers Guide Sheet*, issued with No. 1 of each volume of *Forestry Abstracts*.

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 4191, 4200, 4882, 5034, 5082, 5093, 5135, 5143, 5248, 5301.

0 (038). Dictionaries

See Nos. 3971, 4566–7.

0 (047.1). Progress Reports

See No. 4778.

0 (048.1). Bibliographical Lists

See also Nos. 4050, 4053, 4092, 4698, 4806, 4880, 4970.

3968. KAPELNER, H. **References on forestry and forest products in Israel—1960.** *Leafl. For. Res. Sta., Ilanoth* No. 15, 1961. pp. 4. 52 refs. [E.] [Cf. *F.A.* 22 No. 1310.]

0 (05). Periodicals. Directories

3969. **World list of periodicals and serials of interest to forestry.** *For. Occ. Pap. FAO* No. 10, 1960.

[Cf. *F.A.* 15 No. 1.] The list has been produced on the initiative of the FAO/IUFRO Committee on Bibliography and as a result of co-operation between the 3 international documentation centres for forestry at Oxford, Reinbek and Washington. It is in loose-leaf form, and the first and second instalments comprise 27 countries, each separately paginated. There is an entry against each publication title indicating the international centre(s) that include it in their coverage list, and the form of citation used.

0 (084.3/.4). Maps. Atlases

See also Nos. 4275–6, 4284.

3970. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 11. Ubangi. A. Sols. B. Végétation. C. Utilisation des sols. D. Géomorphologie. **[Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 11. Ubangi. A. Soils. B. Vegetation. C. Land use. D. Geomorphology.]** Institut National pour l'Étude Agronomique du Congo (I.N.É.A.C.), Brussels. 1960. pp. 82 + 1 + 8 photos, 1 set of dgms., 13 maps. 26 refs. [F.]

Consists of an explanatory booklet (*P. Jongen et al.*), the soils map and the land-use map (*P. Jongen* and *M. van Oosten*; each 5 sheets; scale 1 : 50,000), the vegetation map (*C. Evrard*; 2 sheets; scale 1 : 100,000), and a geomorphological map (*J.-M. Berce*; 1 sheet; scale 1 : 200,000).

0 - - 011. Terminology. Nomenclature

See also Nos. 4566–7, 4927, 4975.

3971. GOOR, A. Y. **Forest terminology (Hebrew).** The Author, Jerusalem. 1961. pp. 104. [E.Heb.]

A list of 692 terms and definitions in Hebrew based on the British Commonwealth Forest Terminology. English, German and French equivalents of terms are given.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.1. Composition, Structure, Mechanics and Thermodynamics of the Atmosphere in General

See also No. 4239.

3972. HERBST, W. Wald und Menschen des Atomzeitalters in biosoziologischer Sicht. **[Forest and man in the atomic age from the biosociological point of view.]** *Allg. Forstzeitschr.* 16 (13/14), 1961 (230–1). 1 ref. [G.]

Briefly discusses the effect of trees and forests on the micro-distribution of radioactive fall-out particles [cf. *F.A.* 21 No. 3938] and the resistance of trees to radiation, mentioning the relatively high resistance of polyploids and the low resistance of many conifers, particularly Pines, in experiments (no actual damage from fall-out has been reported from Central Europe), and the tendency of trees (observed in the U.S.A.) to collect volatile radioactive I from the atmosphere. In experiments at Freiburg with trees exposed to an air-stream containing very small quantities of volatile radioactive I, broadleaved species in particular intercepted considerable amounts on the surface of the leaves; ca. ⅓ of this penetrated into the tissues and was translocated through the vascular system.

111.2. Radiation and Temperature

3973. BAUMGARTNER, A. Die Lufttemperatur als Standortfaktor am Gr. Falkenstein. 2. Mitteilung. **[Air temperature as a site factor on the Grosser Falkenstein. 2.]** *Forstwiss. Cbl.* 80 (3/4), 1961 (107–20). 9 refs. [G.g.e.]

[Cf. *F.A.* 22 No. 2671.] Presents data on monthly air-temperature means on the W. slope, with particular attention to temperature inversion zones and the influence of the valley.

111.8. Climatology. Climate and Microclimate

See also Nos. 4211, 4228, 4260–1, 4272–3, 4283, 4332–3, 4353.

3974. IGOŠINA, K. N. Opyt botaniko-geografičeskogo rajonirovanija Urala na osnove zonal′nyh florističeskih grupp. I. **[An attempt at division of the Urals into botanical and geographical regions on the basis of zonal floristic groups. I.]** *Bot. Ž.* 46 (2), 1961 (183–200 + 1 tbl.). 9 refs. [Russ.e.]

Describes, tabulates and maps the natural regions of the area. Three main regions are distinguished (arctic, forest, steppe), which are further subdivided into zones, sub-zones, belts, etc.

3975. SOKOŁOWSKI, A. W. Zmienność pozioma temperatury powietrza w zespołach leśnych Białowieskiego Parku Narodowego. **[The horizontal variations of air temperature in forest associations of the Białowieża National Park.]** *Ekologia Polska, Warszawa 8A* (4), 1960 (65–84). 9 refs. [Pol.pol.g.g.] O.R.S.

Measurements were made in June–Sept. 1956 and April 1957–July 1958 in *Querceto-Carpinetum typicum*, *Pineto-Vaccinietum myrtilli*, *Pineto-Quercetum* and *Circaeo-Alnetum*. Results are given in graphs and tables.

3976. JAKUCS, P. Mikroklimaverhältnisse der Flaumeichen-Buschwälder in Ungarn. **[The microclimate of *Quercus pubescens* scrub forest in Hungary.]** *Acta Agronomica Academiae Scientiarum Hungaricae, Budapest* 9 (1/2), 1959 (209–36 + 2 plates). 15 refs. [G.g.e.russ.] A.P.B.

Presents and discusses data on temperature, evaporation and wind from three sites covered with two types of these communities, occurring on forest margins, karst-type slopes, etc. The drying effect of wind was the most important ecological factor determining their physiognomy. Comparative data from neighbouring high forest and open ground, between which the scrub forest is transitional, are presented.

3977. LÜTZKE, R. Das Temperaturklima von Waldbeständen und -lichtungen im Vergleich zur offenen Feldflur. **[The temperature regime of forest stands, glades, and open ground.]** *Arch. Forstw.* 10 (1), 1961 (17–83). 44 refs. [G.g.russ.e.]

Views on the temperature regime of the air in temperate forests depend on classical comparisons with the temperature in the open (field), both measured at 1·5 and 2 m. These measurements neglect the temperature gradients due to different conditions at the soil, butt, middle and upper bole, and crown levels, and at various heights in the open. Such differences sometimes tend to a minimum in the 1·5- and 2-m. zones hitherto observed, and those results are further vitiated by radiation errors of the screens used and by the placing of the field stations in glades or too near forest margins. To avoid these errors, continuous recordings over a whole year were made in the open, >1·2 km. from any forest, and in a 20-m. Pine stand with a Beech pole understorey. Additional data were taken in a 23-m. Beech stand, a newly planted 0·5-ha. clearing in forest, and in a patch of 0·2 ha. cleared of all growth in a 3·5-ha. clearing. The graphs and calculation are based on 65,000 hourly readings. The results lead to a considerable revision of ideas previously held. The data are graphed and discussed in great detail, e.g. frequency distributions, daily, monthly and annual means, ranges, extremes, variations due to time of day, night and day, cloudy skies, open quiet radiation weather, forest in leaf and leafless, snow, wind, soil temperature, etc., the temperature gradient with height, the coldest level, the great importance of radiation in day temperatures etc. It is shown that, in general, the forest has a greater annual mean-temperature range (except near the soil) than the open and that glades have a greater range than either the open (even at 15 m.) or the forest (up to crown level). The coldest level in both forest and field is 25 cm. The higher day and lower night temperatures in the crown are advantageous for the assimilation/respiration balance.

3978. ARAGÃO, M. B. Algumas medidas microclimáticas, em mata da região 'bromelia-malaria', em Santa Catarina, Brasil. I. Temperatura do ar, umidade relativa e evaporação. II. Efeits do abrigo, temperaturas extremas, amplitude térmica diária, temperatura do solo, radiação global, velocidade do vento, e deficít de saturação. **[Some microclimatic measurements in the forests of the "bromelia-malarial" region of Santa Catarina, Brazil. I. Air temperature, relative humidity and evaporation. II. Screen effect, extremes of temperature, daily range of temperatures, soil temperature, gross radiation, wind velocity and saturation deficit.]** *Memórias do Instituto Oswaldo Cruz, Rio de Janeiro* 56 (2), 1958 (415–51); 57 (1), 1959 (45–72). Several refs. [Port.port.e.g.] I.I.E.

114. Soil. Soil Science

114.1. Soil Physics

See also Nos. 3982, 3986–8, 4019–20, 4024, 4172, 4191, 4539, 4915.

3979. CHOUDHURI, J. C. B. **A simple soil penetrometer for biological work.** *Indian For.* 87 (4), 1961 (253–6). 7 refs.

In the course of a study of oviposition by locusts and grasshoppers in relation to soil structure, an apparatus (scale drawing given) was designed to measure the degree of compaction of the top soil (0·6–6 in.). The method of operation is described, and possible applications in field and laboratory studies are discussed. The device is inexpensive, simple, and can be conveniently carried in a field collecting bag.

3980. KONOVALOVA, A. S. Sravnitel'naja harakteristika dernovo-podzolistyh lesnyh i raznoj stepeni okul'turennosti počv. **[Comparative characteristics of sod-podzolic forest soils and soils under various degrees of cultivation.]** *Počvoved.* 1961 (3), (71–8). 9 refs. [Russ.russ.e.] A.P.B.

Presents detailed tabulated data on the physical and chemical properties of sod-podzolic clay-loam soil in the Smolensk region under Spruce/Aspen forest, 30–40 years old, with an underwood of *Sorbus aucuparia* and *Corylus avellana*. This soil is compared with ones originally similar, but which have undergone various degrees of agricultural cultivation for various periods.

3981. GREČIN, I. P., and CH'ÊNG, Y.-S. Dinamika kisloroda i uglekisloty počvennogo vozduha v dernogo-podzolistoj počve. **[Changes in the oxygen and carbon dioxide in the air in sod-podzolic soil.]** *Izv. Timirjaz. Sel'.-hoz. Akad., Moskva* 1960 (6), (68–79). 30 refs. [Russ.russ.e.] O.W.

Tabulated data on the changes in the O_2 and CO_2 contents of the soil air under various agricultural crops, and under a Norway Spruce forest, 80–90 years old, already described [see *F.A.* 20 No. 1363]. The data for the Spruce stand cover the period April 1956 to Oct. 1957.

114.2. Soil Chemistry

See also Nos. 3990–8, 4004, 4006–7, 4011, 4178–82, 4191–2, 4272, 4539, 4915.

3982. FIRSOVA, V. P. Ob izmenenii fiziko-himičeskih svojstv nekotoryh počv Urala pod vlijaniem lesnyh požarov. **[Changes in the physico-chemical properties of some Urals soils due to the effect of forest fires.]** *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (13–20). 19 refs. [Russ.]

Tabulates analytical results for soils of clear fellings—(*a*) from parts where slash burning had been done 1–4 years previously, and (*b*) from unburned parts, in central taiga Spruce forests (montane-forest, acid, non-podzolized soils) and in southern taiga Pine forest (sod-podzolic soils). Acidity of the upper soil horizons was reduced both in (*b*) and, especially, in (*a*), as compared with soils under forest. The P_2O_5 content increased in the first year after felling in (*b*) but then returned to its former value; on (*a*) it remained higher during the whole 4 years. Burning reduced soil moisture in the topmost horizon and increased it in the underlying mineral soil. The effects of burning on soil nutrient supplies and their distribution in the profile vary with region and soil properties, and these factors should be taken into account in further studies.

3983. HATCH, A. B. **Ash bed effects in Western Australian forest soils.** *Bull. For. Dep. W. Aust.* No. 64, 1960. pp. 19. 14 refs.

Presents results of investigations made on two forest types, viz. Karri and Wandoo, covering a wide range of climatic and soil types in W. Australia, in which the effects were studied of ash beds (formed after slash burns which have temperatures of ca. 850° C.) on the early development and growth of Eucalypts. The chemical changes in ash beds were most marked in the first inch of the soil, decreasing rapidly with depth. The most important changes were increases in pH, total soluble salts, and nutrients extracted by 2·5% acetic acid, and the formation of $CaCO_3$. However, soil organic matter was reduced by the burns. The stimulating effect of an ash bed falls off rapidly with increasing age, but it is shown that at least 20 years must elapse before the ash bed soils revert to their previous state. [Cf. *F.A.* 19 No. 1620; 21 No. 2960.] *From author's summary.*

3984. NIU, C.-W. Priroda gumusa počv tropikov i vlažnyh subtropikov. **[The nature of the humus of soils in the tropics and moist subtropics.]** *Počvoved.* 1961 (5), (34–42). 13 refs. [Russ.russ.e.] A.P.B.

Presents and discusses tabulated data on the humus content and composition, N content, C/N ratio, and humic- and fulvic-acid contents of (*a*) red earths and lateritic soils from the Hokow and Kunming areas of Yunnan Province, under *Ficus*/evergreen Oak forest with lianes, Bamboo, etc., and (*b*) lateritic soils from the northern part of North Vietnam, under evergreen tropical forest with Bamboo. Data on a red earth from the Caucasus, under *Prunus laurocerasus* with lianes, are used for comparison.

3985. SKRYNNIKOVA, I. N. **Soil solutions of the southern part of the forest belt and their role in contemporaneous soil formation processes.** *In* Sovremennye Počvennye Processy v Lesnoj Zone Evropejskoj Časti SSSR, Počvennyj Institut im. V. V. Dokučaeva, Akademija Nauk SSSR, Moscow. 1959. pp. 50–169. [Russ.] From *abstr.* in *Chem. Abstr.* 55 (2), 1961 (1983). P.R.

Discusses the results of an examination of forest (Spruce, Pine and Birch) soils made in 1945–48 in the southern part of the forest zone (Moscow province), indicating the total chemical composition of the soils and soil solutions as observed by the use of various potentiometric, colorimetric and micro-methods [cf. *F.A.* 20 No. 35].

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 4007, 4011, 4175, 4178–80, 4191, 4271–2, 4539, 4913, 4915, 5316.

3986. ZONN, S. V., and LI, C.-K. K poznaniju vodnogo režima tropičeskih lesnyh počv. **[On the moisture regime of tropical forest soils.]** *Počvoved.* 1961 (3), (12–22). 4 refs. [Russ.e.] A.P.B.

Studies were made in the two tropical monsoon forest types already described [see *F.A.* 22 No. 2702] from mid-Jan. 1959 to the end of Feb. 1960. Data are given on air temperatures, precipitation, soil density and porosity (by 10-cm. horizons, to a depth of 210 cm.), and the content, distribution and fluctuations of soil moisture (always to a depth of 150 cm., and sometimes to 250 cm.). Results indicate that differences in the moisture regime are caused not only by soil properties, but also by the composition of the vegetation. The Bamboo dries the soil less than the *Gironniera* forest in the rainy season, and more in the drier seasons. Under Bamboo, the soil m.c. remains longer at wilting point than in the *Gironniera* forest, where water consumption and soil drying proceed more intensively in the rainy season and relatively less in the other seasons. During the rainy season, moisture does not accumulate in the soil; temporary excess moisture (above field capacity) is noted only in the top 20–30 cm., and quickly disappears. The results also indicate that intensive leaching cannot take place (it is limited to one month per year, at most, probably affecting the top 2–2·5 m. of soil). This, together with the other findings, indicates that concepts on the genesis of such forest soils under a tropical monsoon climate should be revised.

3987. LEBEDINOVA, N. S. Režim vlažnosti temno-buryh lesnyh počv orehovyh lesov. **[The moisture regime of the dark-brown soils of the [S. Kirghiz] *Juglans regia* forests.]** *Počvoved.* 1961 (5), (21–33). 20 refs. [Russ.russ.e.] A.P.B.

Gives the results of studies in 1949–51 on dark-brown forest soils formed on loess-type clay-loam under natural *J. regia* forest (1st storey, 52 stems/ha., mean height 22 m., mean diam. 42 cm., site class II–III; 2nd storey, groups of *J. regia*, mean height 12 m.). Comparisons are made with a similar, old-field soil near the forest site. The moisture regime of the forest soils is classified as being of the leaching type. Methods of cultivating *J. regia* are suggested, as follows: on the virgin, dark-brown forest soils, the soil may be worked in patches, with subsequent light scarification and mulching to ensure that the plants have moisture even in droughty years. On old-field sites, the surface layers of soil dry out below wilting point for long periods in droughty years. In afforesting these sites, best results are obtained by cultivating the soil either entirely or in strips, coupled with mulching or watering in the first few years after planting.

3988. VIENNOT-BOURGIN, G. Rapports du sol et de végétation. Premier Colloque de la Société botanique de France, Paris 15 Juin 1959. **[Relations of soil and vegetation. First Colloquium of the French Botanical Society, Paris 15th June 1959.]** Masson et Cie., Paris. 1960. pp. 183. Many refs. [F.]

Includes the following papers, with discussion: Influence of the vegetation on the soil in the moist and semi-moist tropics (*G. Aubert*) [a review with 21 refs.]; Vegetation and podzolization in temperate climates (*P. Duchaufour*); The influence of the vegetation on the conservation of the soil and the restoration of its fertility in the humid tropics (*M. Schmid*) [including shifting cultivation]; The "Ray" system of shifting cultivation on some high plateaux in Viet-Nam (*R. Champroloix*); The complex "soil-vegetation-fertility" in the Ankaizina region of Madagascar (*R. Dufournet*); Revegetation of eroded soils (*R. Rol*) [in S. France]; The influence of vegetation and organic matter on the microflora of the soil (*J. Pochon et al.*); An instance of soil-vegetation relations in the humid tropics: the Ivory Coast (*N. Leneuf* and *G. Mangenot*) [including sketchmaps of soil and vegetation]; The moisture regime of the soil, an important edaphic factor in the distribution of vegetation types in the humid tropics (*G. Lemée*); The enclaves of acidophile vegetation in the Jura and the climax problem (*J. L. Richard*; *C. Favarger*); The effect of certain heavy metals (Cu, Co, Mn and U) on the vegetation of Haut-Katanga (*P. Duvigneaud et al.*) [with lists of tolerant plants, accumulation of metals, including U, in foliage].

3989. **Litter depth and weight studied.** *Extr.* from *Rep. Cent. St. For. Exp. Sta. 1960*, 1961 (12).

Litter in sample stands of *Pinus echinata* averaged ca. 11·3 tons/acre (dry weight) and 1·6 in. deep, the amount increasing with increasing stand b.a. Annual litter fall averages ca. 1·7 tons/acre, of which 60% falls during Sept.–Nov.

3990. SAMUSENKO, V. F. K harakteristike sostava i svojstv lesnyh podstilok. **[The composition and properties of forest litter and humus.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (90–8). [Russ.russ.]

An analysis of the amount, composition (needles, cones, bark, moss, etc.), chemical composition, biochemical activity, and physico-chemical properties of the litter-and-humus layer in plantations of pure, or almost pure, *Picea* [*abies*] and *Larix* sp. aged 15, 56 and 95 years, in the Moscow region. Amount and composition varied with species and age. All the Spruce litters contained more mobile organic compounds and sesquioxides than the Larch.

3991. REMEZOVA, G. L., and UTENKOVA, A. P. **Changes in anatomical structure and chemical composition of leaves rotting on the forest ground.** *In* Potreblenie i Krugovorot Azota i Zol′nyh Elementov v Lesah Evropejskoj Časti SSSR. 1959. pp. 229–44. [Russ.] From *abstr.* in *Chem. Abstr.* 55 (2), 1961 (1979). P.R.

The character and speed of decomposition (observed to be most rapid in leaves from Ash, Hazel and Lime, which form a better substrate for micro-organisms and invertebrates) depend on species, season, and conditions. In the early stages, there was rapid decrease of protein, resins, and hemicelluloses, and less rapid of cellulose. Water-solubles increased, and in summer and autumn cellulose destruction prevailed.

3992. LERNER, R. H., and EVENARI, M. **The nature of the germination inhibitor present in leaves of *Eucalyptus rostrata*.** *Physiol. Plant., Copenhagen* 14 (1), 1961 (221–9). 10 refs. [E.e.]

Investigations of the properties of the substances in *E. rostrata* leaves that inhibit growth and germination indicated that they contain a carbonyl group and a C-C double bond. Mesityl oxide was shown to have similar properties. Tests with soil from two *E. rostrata* stands in Israel showed that the inhibitors do not accumulate in the soil to inhibitory concentrations. Vegetation beneath the trees may be controlled by an interaction of the inhibitory substances remaining in the leaves with the physical effects of the barrier formed by the litter layer.

3993. Radaelli, L. Alcuni aspetti del problema dell' humus alla luce delle più recenti ricerche. **[Some aspects of the humus problem in the light of the most recent research.]** *Ital. for. mont.* 15 (6), 1960 (220–31). 93 refs. [It.it.]

Reviews the present state of knowledge about humus in relation to its origin, chemical composition, classification, the process of humification, and the influence of microbiological processes on its formation.

3994. Stoeckeler, J. H. **Organic layers in Minnesota Aspen stands and their role in soil improvement.** *For. Sci.* 7 (1), 1961 (66–71). 15 refs.

Populus tremuloides, a post-fire pioneer, is the most widely spread hardwood in N. America, covering, in the three Lake States, ca. 198 million acres (39% of the forest area) and is now the leading pulpwood species there. From samples in 29 Aspen stands of various ages, examined separately for their *L*, *F*, and *H* layers, it was found that *L* varied from 1700 lb. (oven-dry) at 10 years to ca. 3200 lb./acre at 33 years. The combined *F* and *H* varied with age of stand from 17,000 to 26,000 lb./acre, *H* contributing 70–90% of this total. About 17,000–20,000 lb./acre of the original humus escapes fire. The net annual accretion of *L*, *F*, and *H* is ca. 825 lb./acre, of which ½–⅔ is lost by incorporation in the soil and in soil organisms, and by leaching. The *F* and *H* layers contain respectively ca. 188 and 363 lb. of N. Repeated burns may consume as much as 370 lb. of N, thus causing a setback in the succession. The *H* layers under Aspen growing on lime soils had considerably more available Ca and Mg than those on more acid soils, with a site index 10 ft. and a m.a.i. 7 cu. ft. (12%), higher.

3995. Lossaint, P., and Rapp, M. Sur la minéralisation de l'azote organique d'un humus brut forestier à la suite d'un labour. **[The mineralization of organic N of a forest raw humus after soil cultivation.]** *C. R. Acad. Sci., Paris* 251 (25), 1960 (3034–6). 4 refs. [F.f.] O.R.S.

The soil under Oak and Scots Pine in the forest of Hagenau was cultivated by rotavator to mix the very thick acid humus layer with the mineral soil below, and samples of the soil were studied. It was found that cultivation activated the organic matter and that, in spite of the strong acidity, considerable nitrification took place.

3996. Livens, J., and Vanstallen, R. Recherches sur l'azote dans l'extrait aqueux de residus organiques en voie de décomposition. **[Nitrogen in aqueous extracts of organic residues in process of decomposition.]** *Agricultura, Louvain* 9 (1), 1961 (25–43). 9 refs. [F.f.du.e.] C.G.B.

[Cf. *F.A.* 20 No. 4068.] Trials in decomposition were carried out in the laboratory on (1) leaves of mixed forest species, (2) Spruce needles, (3) straw, (4) peat, (5) farmyard manure, (6) forest humus, and (7) garden mould. These were watered every week with distilled water, and the leachates analysed for N and C. N was divided into 4 fractions, viz. $-NO_3$, NH_3 (distillation with MgO), NH_3 or organic N (distillation with NaOH), and organic N (Kjeldahl method). Loss of dry matter and of N after 10 months varied respectively from 4 to 60, and from 2 to 21%. The aqueous extracts contained $-NO_3$, NH_3 and organic N, with little or no quantitative connexion between these three forms. Loss of N with time is shown by means of cumulative curves that are generally straight, save with a few forest litters in which, at a given moment, the loss of soluble N rises sharply. This happens with $-NO_3$ from mixed forest, Oak and Spruce litter, and also with NH_3 and organic N from Oak and Spruce litter, but was not observed with Beech litter. The time at which this rise occurs varies considerably with the type of litter. Litter extracts influence the quantity and quality of soluble N in the substrate. Most extracts slightly reduce the $-NO_3$ and NH_3 content and increase the organic N content, though farmyard manure and garden mould extracts increase the $-NO_3$ content. These results were obtained with very dilute litter extracts and after a brief incubation period. *From authors' summary.*

3997. Weetman, G. F. **Mor humus studies (Project 59–3). Progress report on field, greenhouse and laboratory experiments to study the nitrogen cycle of Black Spruce growing on mor humus.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 121, 1961. pp. 15.

Describes the purpose of the study and methods used, and presents a few preliminary results of the field work, begun in 1959. A more complete report will be issued when work is finished and the data have been analysed.

3998. Hartmann, F. Dynamik und Naturgesetzlichkeit im Nährstoffhaushalt des Waldes. II. Teil. Reaktionsempfindlichkeit des Nährstoffumlaufes in Waldböden. **[The nutrient economy of the forest, its dynamics and natural laws. Part II. The sensitivity of the nutrient regime of forest soils.]** *Cbl. ges. Forstw.* 77 (4), 1960 (227–46). 3 refs. [G.g.e.]

[Cf. *F.A.* 20 No. 4082.] Analysis of soil profiles under natural and nearly natural stocking (Oak in Wisconsin, Oak and mixed hardwood/conifer stands in various parts of Austria) and under neighbouring artificial conifer stands (mainly Spruce and Pine) on originally identical soils, shows how rapidly deterioration progresses, under the conifers, in terms of pH, loss of nutrients and their distribution over the soil horizons, soil structure, humus type, etc.; healthy soils changing into sick soils, podzols and even sphagnum peat, within a few decades. Conversely, soil regeneration processes under isolated Beech trees on degraded conifer sites are also instanced, but it is thought that, without help from fertilizers, these are too slow for practical purposes.

114.4. Soil Classification. Soil Types

See also Nos. 3970, 3980, 3984–8, 4003, 4174, 4270–3, 4275, 4332, 4812.

3999. TEDROW, J. C. F., and HARRIES, H. **Tundra soil in relation to vegetation, permafrost and glaciation.** *Oikos* 11 (2), 1960 (237–49). 58 refs.

A review, giving the distribution of arctic soils in relation to the northern tree line, arctic vegetation, permafrost, and glaciated areas, and discussing soil processes in the arctic and subarctic areas.

4000. CONDON, R. W. **Soils and land form of the Western Division of N.S.W.** *J. Soil Conserv. Serv. N.S.W.* 17 (1), 1961 (31–46). 14 refs.

Presents a map of 9 soil groups in western New South Wales; these are described under the 3 major land forms on which they occur, with tabulated data on dominant timber and principal pasture species. [Cf. *F.A.* 22 No. 1375.]

4001. HEIKURAINEN, L. **Swamp forestry research in Finland.** *Repr.* from *Silva fenn.* No. 108, 1960. pp. 21. 100 refs. [E.fi.]

A review, based on a selected bibliography, discussing the formation and area of peatlands; swamp site types and their suitability for drainage; site factors on swamps; and techniques of drainage and of management of swamp forests.

4002. HEIKURAINEN, L. Metsäojituksen vaikutuksesta puuston kasvuun ja poistuman. Hakkuusuunnitteiden laskemista varten. **[The influence of forest drainage on growth and removal in Finland, as a basis for estimating allowable cut.]** *Acta for. fenn.* 71 (8), 1961. pp. 71. 33 refs. [Fi.e.*e*.]

It is estimated that by draining a further 3·8 million ha. of a total of 5·4 million ha. of swamps, growth could be increased by ca. 20%, mainly in softwoods. The development of the increase would, however, be slow. Assuming a 50-year draining programme, the mean increase would be reached in ca. 35 years, or assuming a 30-year programme, in ca. 25, and mean increase in removals from these areas 2–3 decades later. *From author's summary.*

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 3998, 4174–5, 4178–84, 4187–8, 4191–2, 4460, 4644, 4910–6.

4003. HEJFEC, D. M. O pitatel′nom režime moščnyh černozemov pod lesom, step′ju i pašnej v rajone Kurskogo zapovednika. **[The nutrient regime of deep chernozem under forest, steppe and ploughland in the region of the Kursk reserve.]** *Počvoved.* 1961 (2), (18–25). 7 refs. [Russ.russ.e.] A.P.B.

Reports on chemical analyses and laboratory pot trials with maize and wheat, undertaken to compare the nutrient status of samples from deep, heavy clay-loam chernozems: (*a*) fertile, under Oak forest; (*b*) fertile, under unmown steppe vegetation; (*c*) leached, ploughland; and (*d*) under Oak forest. Considerable differences were found, particularly in the contents of available P and K. Soils (*a*) and (*d*) had the greatest contents of total and available P and K.

4004. WARING, H. D. **Forest soil research at Jervis Bay, N.S.W.** *Soil News, Australian Society of Soil Science* No. 3, 1957 (23–5). From *abstr.* in *Soils & Fertil.* 21 (4), 1958 (No. 1568).

The area consists mainly of coastal sand dunes over a basement of coarse sandstone. The fine-sand fraction of the sand consists mainly of hornblende, ilmenite-magnetite and anatase, and that of the coarse sandstone of leucoxene and tourmaline. The sands are generally low in P content. It is likely that many of the elements essential for plant growth are supplied from sea spray and this may explain the presence of *Eucalyptus* and *Syncarpai* spp. 100 ft. high.

4005. HOLSTENER-JØRGENSEN, H. Indfygning af jord i en plantages vestrand. **[Drift of soil into the western edge of a plantation.]** *Forstl. Forsøgsv. Danm.* 26 (3), 1960 (389–97). 1 ref. [Dan.e.*e*.]

In March 1959, beakers containing 50 ml. glycerine to ensure the retention in them of wind-blown material were buried to the rim at different points within a plantation of Spruce, 50–60 years old, underplanted in some parts with Beech and Silver Fir; some beakers were also buried in a shelterbelt of Spruce 6 m. high, lying 120 m. west of the plantation. The beakers were taken up at the end of July and, after fallen needles, insects, etc. had been removed, their content of mineral substances was determined. The highest ash contents (577 g./sq. m.) were found, for some reason not yet explained, in beakers at a distance of 80 m. inside the plantation, the next highest (185·7 g.) on the edge of the plantation and the lowest (22·1 g.) 40 m. inside it. The drift of such amounts, comprising the smallest particles, which are also the highest in nutrients, from arable land into the edge of a plantation, is bound to influence the soil fertility of this edge.

114.6. Soil Biology

See also Nos. 3988, 3991–3, 4405, 4725, 4812, 5316.

4006. MOREAU, R., JACOB, M., and AUGIER, J. Sur le métabolisme du phénol dans les sols. **[Phenol metabolism in soils.]** *C.R. Acad. Sci., Paris* 251 (11), 1960 (1179–81). 1 ref. [F.f.] O.R.S.

Soils studied were (*a*) a fairly fertile garden soil, and (*b*) a forest rendzina. Five culture media, all containing phenol as the source of C, were used. Phenol was attacked more rapidly in (*b*) than in (*a*), and was broken down more readily when $(NH_4)_2SO_4$ was present as source of N, than when KNO_3 was present.

4007. RAMBELLI, A. Intorno alla utilizzazione microbica dell'olio essenziale di eucalitto. **[The utilization of essential oil of Eucalypts by the soil microflora.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (5–14 + 3 photos). 4 refs. [It.it.e.]

In view of the relatively high content (3%) of essential oil in Eucalypt leaves, a study was made of the effect of eucalyptol on the soil microflora. It was found that, in a C-free medium, eucalyptol encouraged the development of the bacteria that give a yellowish brown colour to the soil and also of certain fungi. CO_2 production in the soil was also stimulated when eucalyptol instead of glucose was used as the energy-producing metabolite.

4008. BERGER-LANDEFELDT, U. Zum Cellulose-Abbau in Böden unter verschiedenem Bewuchs. **[Cellulose decomposition in soils under different vegetation.]** *Oikos* 11 (2), 1960 (311–24). 41 refs. [G.g.]

Tests on the rate of cellulose decomposition were carried out on 4 plots in the Grunewald (Berlin City Forest) in 1958–59. The different soils and vegetation covers, including Oak, Birch, and plantations of Scots Pine and *Populus* × *canadensis*, are described. Strips of cellulose were placed in the soil at depths of 2, 8, and 20 cm. for 3-week periods throughout the growing season, and decomposition measured by determining the weight loss. At the same time, soil moisture and pH were measured. The least decomposition was found in sandy, acid soils; the most in an alkaline riverside mud where *P.* × *canadensis* had been planted. Decomposition decreased with increasing soil depth. The rate of decomposition in the 3-week periods was determined chiefly by the weather, and was more closely correlated with air temperature than with precipitation. No influence of variation in soil reaction on decomposition was observed.

4009. LI, H.-T. Količestvo mikroorganizmov v rizosfere različnyh drevesnyh porod pri gnezdovom poseve. **[The quantity of micro-organisms in the rooting zone of various nest-sown woody species.]** *Agrobiologija* 1960 (6), (926–8). [Russ.] I.M.I.

Tabulates the results of studies made in 1959 and 1960 of the soil in plots of Oak, Maple, *Caragana arborescens*, Poplar, Birch, Larch and Scots Pine established in 1949 in the Lenin Hills. The following types of micro-organisms were distinguished: ammonifying, nitrifying and denitrifying bacteria, *Azotobacter*, butyric-acid bacteria, *Clostridium pasteurianum*, cellulose-decomposing aerobic bacteria, and fungi. The microflora of each tree species varied both quantitatively and in composition from that of the others. The richest microflora was found in the rooting zone of Oak, *C. arborescens*, and Maple.

4010. GEMEINHARDT, H. Bodenmikrobiologische Beiträge zum Robinienproblem (2. Mitteilung). **[Soil microbiology in relation to the Robinia question. (2nd communication).]** *Arch. Forstw.* 9 (12), 1960 (1082–1104). 12 refs. [G.g.russ.e.]

The object of these studies is to enter more deeply into the questions posed and complete the answers already given [see *F.A.* 21 No. 2848]. Comparisons of the microbial status and activity in (*a*) soils under Robinia and (*b*) soils under pure Pine, carried out by the various methods referred to, gave the following results: in saccharase and protease fermentation the activity in (*a*) was 2–3 times greater. Under incubation, (*a*) produced both NH_4 and NO_3 while (*b*), except in one plot, produced only NH_4. Incubation with peptone and urea showed strong or medium decomposition reactions with (*a*) and only slight reactions with (*b*). The ratio of active to inactive bacteria was higher in (*a*). This is ascribed to long-term amelioration of soils 40 years under Robinia. In plated soil samples, both (*a*) and (*b*) showed small, medium, and occasionally large, colonies but giant colonies with much more than 200 single cells are characteristic of Robinia-ameliorated soils. *Azotobacter chroococcum* was found in only one of the 24 plots. To the ameliorating effects already ascribed to Robinia planting should be added soil loosening and a richer and more stable life community.

4011. HÜSER, R. Die Bindung des Luftstickstoffs durch Mikroorganismen im Waldboden. **[Fixation of aerial N by micro-organisms in the forest soil.]** *Mitt. StForstverw. Bayerns* No. 31, 1960 (61–9). 6 refs. [G.]

A preliminary report on incubation experiments with humus from conifer stands by a highly sensitive method using air enriched with 10–15% of heavy N. The % (though not the absolute) increase of N was greatest in a Pine raw humus poorest in available mineral N, and least in a mull-like *moder* under Spruce on a brown forest soil. In a *moder* humus from a plot that had been fertilized with basic slag and lime 6 years earlier, it was greater than in the untreated control. The effect of available mineral N on fixation of atmospheric N was further shown in experiments with a *moder* humus, where accumulation of mineral N was considerable and fixation of atmospheric N small. The addition of comminuted litter alone had little effect, but when some of the rich, loess-type mineral soil (the clay fraction of which reduced the amount of available mineral N) was also added, fixation of atmospheric N increased from <1 g./ha. in 4 weeks to >2 g. When K, P and Mo were added to the humus + litter, accumulation of mineral N became so great that fixation from the air almost ceased. Desiccation of incubating samples increased atmospheric N fixation.

4012. THORNTON, R. H. **Fungi of some forest and pasture soils.** *N.Z.J. agric. Res.* 3 (4), 1960 (699–711). 26 refs. O.R.E.

The fungi occurring in two silt loams under mixed forest dominated by *Beilschmiedia tawa*, and also in five soils under pasture, were examined at various seasons. Greater numbers of mycelia were isolated from soils under pasture than from the same soils under forest. Season and local weather conditions appeared to influence fungal growth. In soils under forest, *Cylindrocarpon radicicola* was predominant and *Fusarium* spp. were absent, whereas in soils under pasture *Fusarium* spp., especially *F. oxysporum*, were predominant.

4013. MENNA, M. E. DI. **Yeasts from soils under forest and under pasture.** *N.Z.J. agric. Res.* 3 (4), 1960 (623–32). 12 refs. O.R.E.

Two kinds of change were seen in the soil yeast flora when native broadleaved forest was replaced by introduced ryegrass/white-clover pasture. A yellow-brown loam under forest contained small numbers of *Candida curvata*; under pasture, yeast numbers were greater and the population was dominated by *Cryptococcus terreus*. In a recent gley soil under forest, *C. curvata* was dominant but *Hansenula* spp. were also present in considerable numbers; under pasture, yeast numbers were less than under forest; *Hansenula* spp. were absent and *C. curvata* was the sole dominant.

4014. NEF, L. Comparaison de l'efficacité de différentes variantes de l'appareil de Berlése-Tullgren. **[The effectiveness of different variants of the Berlése-Tullgren apparatus.]** *Z. angew. Ent.* 46 (2), 1960 (178–99). 29 refs. [F.f.du.g.e.] O.H.

Data on the micro-arthropods collected from a Pine litter and a sphagnum substrate by five variants of the Berlése-Tullgren funnel are compared and analysed. No method proved best for all groups or for the same group in both substrates.

4015. HARTENSTEIN, R. **On the distribution of forest soil microarthropods and their fit to 'contagious' distribution functions.** *Ecology* 42 (1), 1960 (190–4). 26 refs.

A study to determine the fit of observed distributions of forest soil micro-arthropods to the expected Poisson, negative-binomial and Neyman-A distribution functions. Six groups of organisms were studied in two areas of mixed hardwood forest. The data obtained indicate that the whole community is closely related and its distribution contagious in nature.

4016. RONDE, G. Waldbodendüngung und Lebensgemeinschaft. Bodenfauna. **[The effect of forest fertilization on the soil fauna.]** *Z. angew. Ent.* 47 (1), 1960 (52–7). 3 refs. [G.g.e.] O.H.

Describes the favourable changes in composition and numbers of soil fauna following fertilizing, particularly with N, P and Ca, in stands of Pine, Spruce and Beech in Württemberg and Bavaria. [Cf. *F.A.* 21 No. 1351.]

4017. BASSUS, W. Der Einfluss der Kalkdüngung auf die Fauna des Waldbodens. **[The influence of liming on the forest soil fauna.]** *Arch. Forstw.* 9 (12), 1960 (1065–81). 10 refs. [G.g.russ.e.]

Gives in some detail the species and groups identified from samples of sandy and medium loam soils, limed and unlimed, under Spruce and Douglas Fir. The fluctuations found in the larger arthropods (Coleoptera, Myriapoda, etc.) probably lie within the normal variation. Fluctuations in Collembola were ambiguous. Mites, particularly oribatids, decreased with liming but differences were not significant. Increases of nematodes with liming were in part significant; species composition of these varied only slightly. Bacteriophages were particularly favoured by liming. Differences due to kind or dosage of lime were not found. There is probably a long-term effect of liming, generally (except for mites) favourable to decomposition by soil fauna.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 4005, 4137, 4362–3, 4458–64, 4469, 4497, 4522, 4537, 4629, 4636.

4018. GRAY, K. M. **A contribution towards a watershed management research programme for the Hunter Valley, New South Wales.** Forestry Commission of New South Wales, Sydney. 1959. pp. 96 + 1 map. 148 refs.

Reviews the main problems of catchment management, discusses the factors contributing to flooding and erosion (grazing, fire, and forest clearance) in the light of current research literature, and makes suggestions for the organization of a proposed research programme.

4019. SUDAKOV, A. V. Vodnyj režim pesčanyh počv v lentočnyh borah Priirtyš′ja. **[The water regime of the sandy soils in the ribbon-like Scots Pine forests of the Irtysh region.]** *Počvoved.* 1961 (5), (54–60). 7 refs. [Russ.russ.e.] A.P.B.

Studies the moisture regime of fine sands of alluvial/aeolian origin under (1) a 17-year Pine plantation of 5000 trees/ha., and (2) typical natural herbaceous vegetation (chiefly grasses), in 1956, in the dry steppe of the Pavlodar region of Kazakhstan. The moisture regime is such that the Pine can grow, regardless of the depth of the groundwater. At the start of the growing season, there was 65–75 mm. of available water in the rooting layer. Even in this year, in which supplies of water were favourable, the Pine transpired only 95 mm., whereas the natural herbaceous vegetation transpired 118 mm. Evaporation from the soil during the growing season was 55–57% of the precipitation for the period. The crowns of the stand, with a green needle mass of 4·15 tons/ha., intercepted ca. 10% of the precipitation. Subsoil flow accounted for 10–18% of the total water loss.

4020. ESCHNER, A. R. **Effect of Scrub Oak and associated ground cover on soil moisture.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 133, 1960. pp. 16. 6 refs.

Soil moisture was sampled through the summer and autumn of 1957 at 3 depths and in 5 cover types in E. Pennsylvania. The types were (*a*) bare ground (scalped), (*b*) ground vegetation, (*c*) Scrub Oak (*Quercus ilicifolia*) with ground vegetation, (*d*) Scrub Oak alone, (*e*) undisturbed humus with cover killed. Significant differences in soil moisture were found between cover types; it was consistently highest under (*e*) and lowest under (*c*). Treatment to kill low-growing vegetation without destroying the humus layer is recommended for making maximum moisture available in establishing planted seedlings. Killing the Scrub Oak alone does not appreciably reduce transpiration losses.

4021. ROWE, P. B., and REIMANN, L. F. **Water use by brush, grass, and grass-forb vegetation.** *J. For.* 59 (3), 1961 (175–81). 6 refs.

Gives results of a study at the San Dimas Experimental Forest, S. California. Wide differences were found between seasonal and annual evapo-transpiration and water yield from deep soil beneath Scrub Oak brush, annual grass, or grass/forb cover. The results indicated that water yield can be increased by conversion from brush to grass except on shallow soils (<3 ft. deep) or in years of low rainfall.

4022. NIXON, P. R., and SCHWAB, G. O. **Water yield prediction in southern Iowa based on watershed characteristics.** *Iowa St. J. Sci.* 35 (3), 1961 (331–42). 13 refs. O.R.E.

Develops a simple approach for estimating the yield of a watershed. The watershed rating thus obtained depends on measurement and observation of 5 characteristics: climate, soil, land slope, land use, and management and conservation practices. Water yields estimated in this way agreed closely with measured yields.

4023. ANDERSON, H. W., and GLEASON, C. H. **Effects of logging and brush removal on snow water runoff.** *Repr.* from *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 51, [1960?] (478–89). 12 refs. [E.e.f.]

Describes the effect of three types of logging [cf. *F.A.* 21 No. 3988], and two of slash disposal. Piling and burning the slash resulted in 3½ in. more water, from snow melt, in late spring compared with leaving it on the ground, and slightly smaller summer losses. Brush removal in strips on an old burn (preparatory to planting Pine) reduced summer losses by 2–6 in., depending on soil depth.

4024. COLTHARP, G. B. **Some effects of a commercial-type clearcut on soil and water relations on a small wooded watershed.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (1), 1960 (12). O.R.S.

Hydrological data were collected from a small water catchment near East Lansing, Mich., from 1941 to 1957, before and after a clear felling in 1951 which removed all trees > 5·5 in. d.b.h. in an Oak/Hickory type of stand. Physical properties of the soil were studied from samples taken from the watershed in 1953 and 1957 and from the adjacent uncut area in 1957. No pronounced changes were found, after felling, in soil texture, bulk density, porosity and permeability; there was an apparent increase in soil organic matter and a decrease in unincorporated organic matter. Soil moisture increased significantly in the growing season of 1952; in 1957, values were intermediate between the high values of 1952 and the mean pre-felling values. Computed evapotranspiration values were lower during the 1952 growing season than during the period before felling or in 1957. Mean soil and air temperatures generally increased as a result of felling. Mean monthly and annual run-off, maximum rates of run-off and mean volume per run-off decreased slightly in the post-felling period. The mean infiltration rate for the catchment, as determined by hydrograph analysis, increased slightly after fellings. A hydrologic summary for the entire period of study indicated no significant change in the established hydrological characteristics of the catchment. The felling has apparently had no harmful effects on the soil or on the water resources of the area.

4025. MARSTON, R. B., and JULANDER, O. **Plant cover reductions by pocket gophers following experimental removal of Aspen from a watershed area in Utah.** *J. For.* 59 (2), 1961 (100–2). 5 refs.

Pocket gophers (*Thomomys talpoides*) have seriously reduced the perennial cover that initially became denser after Aspen was removed in 1947 in order to lessen evapo-transpiration losses [cf. *F.A.* 15 No. 1059]. Annuals have increased, but total cover may become insufficient to give protection against erosion [cf. *F.A.* 13 No. 3579]. Data on foliage ground cover and injury to perennials are tabulated by species for areas (*a*) with and (*b*) without Aspen. Gopher mounds are twice as numerous on (*b*) as on (*a*).

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 4662–4, 4771 *et seq.*, 5174 *et seq.*

4026. LAMPEL, G. Die morphologischen und ökologischen Grundlagen des Generationswechsels monözischer und heterözischer Pemphiginen der Schwarz- und Pyramidenpappel. **[The morphology and ecology of generation sequences of non-migratory and migratory Pemphiginae of Black and Lombardy Poplars.]** *Z. angew. Ent.* 47 (3), 1961 (334–75). 71 refs. [G.g.e.] O.H.

Chiefly a discussion of life cycle and distinguishing characters (of life-forms and species) of the migratory *Pemphigus populi-nigrae* and *P. bursarius*, and the non-migratory *P. spirothecae*, the latter being smaller and slower to develop. Enemies are also discussed.

4027. BOVEY, P., and MAKSYMOV, J. K. Le problème des races biologiques chez la tordeuse grise du mélèze *Zeiraphera griseana* (Hb.) (note préliminaire). **[The problem of biological races in *Semasia diniana*. Preliminary note.]** *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich* 104 (Festschrift Steiner), 1959 (264–74). 21 refs. [F.g.e.] L.S.

Describes and discusses the two genetically distinct forms occurring in Switzerland [cf. *F.A.* 21 No. 713], differing in hosts (Larch and Pines—mainly *Pinus cembra* and *P. mugo* but also *P. sylvestris*), larval colour (the Larch form dark-grey to black, the Pine form yellowish-grey) and bionomics (the Larch form, following its host, developing earlier) but not clearly distinguishable as adults. A form attacking *Picea abies* in Czechoslovakia was indistinguishable from the Pine form of Switzerland.

4028. WITTIG, G. Morphologie und Entwicklung der Raupen des Tannentriebwicklers *Choristoneura murinana* (HB.) (Lepidopt., Tortricidae). II. Die Entwicklung der Geschlechtsorgane. **[Morphology and development of larvae of *C. murinana* (Lepidoptera, Tortricidae). II. Development of the sexual organs.]** *Zoologische Jahrbücher* (*Abteilung für Anatomie und Ontogenie der Tiere*), *Jena* 78 (1), 1960 (145–66). 10 refs. [G.g.] O.R.S.

Description and comparison with the development of *Solenobia triquetrella*. Criteria for determining the sex of lepidopterous larvae are reviewed in the light of present findings. [Cf. *F.A.* 21 No. 48.]

4029. EVANS, D. **A revision of the genus *Enypia* (Lepidoptera: Geometridae).** *Ann. Ent. Soc. Amer.* 53 (5), 1960 (560–74). 16 refs. O.R.S.

Re-describes *E. venata*, *E. griseata*, *E. packardata* and *E. coolidgi*, with data on the morphology of different stages, life cycles and ecology, parasites, distribution, and host plants (the insects attack many conifers in western N. America). Keys are given to larvae and adults.

4030. WONG, H. R. **Evolution of the sawfly genus *Pristiphora*.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (6), 1960 (1676). O.R.S.

4031. CLARIDGE, M. F., and ASKEW, R. R. **Sibling species in the *Eurytoma rosae* group (Hym. Eurytomidae).** *Entomophaga* 5 (2), 1960 (141–53). 13 refs. [E.e.g.] O.H.

A discussion of the *E. rosae* aggregate, stressing the importance of biological data in the taxonomy of Chalcidoidea; comparative descriptions, including data on biology, hosts, and the morphology of eggs, are given for six species, including *E. brunniventris* found in cynipid galls on Oak, and *E. aciculata* from nematine and possibly other galls on Willows.

15. Animal Ecology. Game and Fish Management. Hunting, Shooting and Fishing

See also Nos. 4025, 4254, 4277, 4759 *et seq.*, 5305.

4032. DODDS, D. G. **The economics, biology and management of the snowshoe hare in Newfoundland.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (6), 1960 (1316). O.R.S.

Includes a section on range relationships and food competition with moose. The favoured hare food, *Betula papyrifera*, is also the favourite woody deciduous food for moose. Browsing of *Abies balsamea* by moose retards cover growth for hares in areas where *A. balsamea* regeneration is dominant, and may increase the period between population peaks.

4033. BATCHELER, C. L. **A study of the relations between roe, red and fallow deer, with special reference to Drummond Hill Forest, Scotland.** *J. Anim. Ecol.* 29 (2), 1960 (375–84 + 1 plate). 20 refs.

The records of game killed in Drummond Hill Forest and those of other observers indicate that roe deer are usually the most abundant deer in a young forest and that their numbers later decline. Red deer become more numerous at a later stage of development, and fallow deer are most numerous in several older forests. These relationships were also established from the faecal-pellet group counts made in Drummond Hill Forest (1957) where it was found that (*a*) roe deer (considered to be a relic population) were uniformly distributed in stands of different bole sizes on the lower slopes but were more numerous in two forest blocks adjacent to Drummond Hill containing only stands of <6 in. diam., and (*b*) red deer were significantly more numerous in forest stands of smaller mean diameter than were fallow deer. These and other observations presented are also consistent with the hypothesis that of the several factors that may determine the relative abundance of roe, red or fallow deer, the stage of growth of a forest habitat is more important than interspecific competition. *From author's summary.*

16. General Botany

160. Plant Chemistry

See also Nos. 3991–2, 4007, 4062, 4064–7, 4072, 4176–82, 4208–9, 4541, 4554, 4646, 4755, 5038 *et seq.*, 5256 *et seq.*

4034. WHITAKER, W. W., VALASTRO, J., JR., and WILLIAMS, M. **The climatic factor in the radiocarbon content of wood.** *J. geophys. Res., Wash.* 64 (8), 1959 (1023–9). From *abstr.* in *Biol. Abstr.* 36 (7), 1961 (No. 19423).

Past research has shown significant variations in radiocarbon contents of woods from different environments, and in the degree to which these radiocarbon contents reflect dilution of atmospheric CO_2 by CO_2 from fossil fuels. The present work attempts to relate these variations to climatic factors. Comparison of radiocarbon contents of individual tree rings with thicknesses of the rings and, in some cases, with meteorological records, suggests that the radiocarbon contents of rings produced in years of heavy rainfall may be relatively low, and that the contents of rings added in times of drought may be comparatively high. *From authors' abstract.*

4035. WIĘCKOWSKI, S. **Studies on the autumnal break-down of chlorophyll.** *Acta Biologica Cracoviensia* (*Ser. Bot.*) 1 (3), 1958 (131–5). From *abstr.* in *Biol. Abstr.* 36 (7), 1961 (No. 21505).

The rate of chlorophyll breakdown was investigated in 9 deciduous woody species (*Acer platanoides*, *A. pseudoplatanus*, *Fagus sylvatica*, *Corylus avellana*, *Crataegus* sp., *Syringa vulgaris*, *Cornus mas*, *Morus alba*, and *Magnolia kobus* var. *borealis*). Chlorophyll disappeared most rapidly in leaves of *Magnolia kobus* (breakdown lasts ca. 35 days) and most slowly in *Morus alba* (>2 months). Only some species lost the total amount of chlorophyll before the leaves were shed (*A. platanoides* and *F. sylvatica*). In some species (e.g. in leaves of *Morus alba*) the breakdown of chlorophyll stops some time before leaf-fall. On the whole (except in *Magnolia*) no relation was found between the breakdown of chlorophyll and the increase in activity of chlorophyllase.

4036. BERNARD-DAGAN, C. Évolution de la teneur en acides gras et résiniques dans le bois de la tige principale du pin maritime. **[Development of the fatty- and resin-acid contents of wood of the stem of *Pinus pinaster*.]** *C.R. Acad. Sci., Paris* 251 (4), 1960 (582–4). 1 ref. [F.f.] O.R.S.

Contents of fatty and resin acids in the leader vary with position and season. Quantities of free resin acids are low in winter, increase in the spring, reach a maximum in summer, and again decrease in winter; the peak is higher and earlier in the mid-part of the stem (July) than at its base (September). Quantities of combined fatty acids are highest in winter and lowest in summer. Free fatty acids and combined resin acids are present in only very small amounts. Amounts of unsaponifiable substances remain constant at different seasons and in different positions.

4037. PURDY, S. J., and TRUTER, E. V. **Taxonomic significance of surface lipids of plants**. *Nature, Lond.* 190 (4775), 1961 (554–5). 2 refs.

Characteristic patterns were given by chromatograms of surface lipids from 10 species of monocotyledons and 14 dicotyledons (including *Rhododendron ponticum*, *Ilex aquifolium*, *Fraxinus excelsior* and *Aesculus hippocastanum*).

4038. IBRAHIM, R. K., and TOWERS, G. H. N. **The identification, by chromatography, of plant phenolic acids**. *Arch. Biochem.* 87 (1), 1960 (125–8). 9 refs. O.R.S.

A method is described for the separation and identification of 21 phenolic acids. A very brief survey of species [including *Populus balsamifera*, *Betula dahurica* and *Tsuga canadensis*] indicates that the distribution of some of these compounds is much more extensive than has been supposed. *From authors' summary.*

4039. KARIYONE, T., *et al.* **[Studies on the existence of 3,4-dihydroxyacetophenone in the leaves of *Picea maximowiczii* Regel.]** *J. Pharm. Soc. Japan* 79 (1), 1959 (125). 6 refs. [Jap.] O.R.S.

4040. **[Chemical constituents of the plants of Coniferae and allied orders. XXV–XXXII, XXXIV–XXXV, XXXVIII–XLVI.]** *J. Pharm. Soc. Japan* 79 (1; 2; 3; 9; 10), 1959 (54–62; 219–20, 265–7; 382–5, 394–5; 1182–4; 1326–7, 1340–2); 80 (6; 10; 11), 1960 (746–58, 782–3; 1488–92; 1557–9, 1576–8, 1647–8). Many refs. [Jap.e.] O.R.S.

(XXV) Studies on plant waxes: 12. Wax from leaves of *Chamaecyparis obtusa* (4) (*T. Kariyone*, *H. Ageta*, and *K. Isoi*); (XXVI) Studies on plant waxes: 13. Waxes from leaves of *Ginkgo biloba* and from *Ephedra gerardiana* (*H. Ageta*); (XXVII) Studies on plant waxes: 14. Natural estolide [in leaf wax of *Pinus thunbergii*] (*T. Kariyone*, *K. Isoi*, and *M. Yoshikura*); (XXVIII) On the constituents in the leaves of *Abies mariesii*, *A. veitchii* and *Tsuga diversifolia* (*T. Kariyone* and *T. Sawada*); (XXIX; XXX) Studies on the components of the leaves of *Picea glehnii*: (2) Chemical structure of a new glucoside, piceid. (3) On the occurrence of picein and resveratrol (*T. Kariyone et al.*); (XXXI) Studies on the structure of sciadopitysin, a flavonoid from the leaves of *Sciadopitys verticillata*: (5) Degradation of sciadopitysin trimethyl ether in ethanolic KOH solution (2) (*T. Kariyone*, *N. Kawano*, and *M. Maeyama*); (XXXII) Studies on the existence of resveratrol and 3,4-dihydroxyacetophenone in the leaves of plants of *Picea* (*T. Kariyone et al.*); (XXXIV) Waxes from the plants of *Casuarina* and *Picea*, and constituents of the grafted plants of Taxodiaceae (*T. Kariyone et al.*); (XXXV) Studies on the structure of sciadopitysin . . .: (6) Degradation of sciadopitysin trimethyl ether in methanolic $Ba(OH)_2$ solution (*T. Kariyone*, *N. Kawano* and *H. Miura*); (XXXVIII; XXXIX) Studies on the structure of hinokiflavone, a flavonoid from the leaves of *Chamaecyparis obtusa*: (2) Composition of hinokiflavone and its degradation in KOH solution. (3) The structure of substance X and ketoflavone (*T. Kariyone* and *Y. Fukui*; *N. Kawano* and *Y. Fukui*); (XL; XLI) Studies on the structure of hinokiflavone . . .: (4) Degradation of hinokiflavone pentamethyl ether in ethanolic KOH solution and the structure of substances Y and Z. (5) Degradation of hinokiflavone pentamethyl ether in methanolic $Ba(OH)_2$ solution (*Y. Fukui*); (XLII) Studies on the structure of a new glucoside, pungenoside, from the leaves of *Picea pungens* var. *glauca* (*M. Takahashi*, *T. Ito*, and *A. Mizutani*); (XLIII) Distribution of flavonoids and stilbenoids of Coniferae leaves (*M. Takahashi et al.*); (XLIV) Studies on the structure of distichin and the components of Taxodiaceae plants, *Metasequoia glyptostroboides* and others (*M. Takahashi*, *T. Ito*, and *A. Mizutani*); (XLV) The structure of sotetsuflavone (*N. Kawano* and *M. Yamada*); (XLVI) On the isolation of hinokiflavone from the leaves of *Cryptomeria japonica* (*N. Kawano*).

4041. ABISCH, E., and REICHSTEIN, T. Orientierende chemische Untersuchung einiger Apocynaceen. **[Exploratory chemical studies of some Apocynaceae.]** *Helv. chim. Acta* 43 (6), 1960 (1844–61). Many refs. [G.g.] O.R.S.

Results of analyses of 31 species are tabulated and discussed.

4042. MAZAKI, T., and ARITOMI, M. **[On the triterpenoids in the leaves of *Euonymus radicans* Sieb. and *E. japonica* Thunb.]** *J. Pharm. Soc. Japan* 79 (7), 1959 (980–2). 9 refs. [Jap.e.] O.R.S.

Friedelanol was isolated, for the first time from a plant, from leaves of *E. radicans*. The mixture of triterpenes from leaves of *E. japonica* was separated into friedelin, epifriedelanol and friedelanol. *From authors' summary.*

4043. ALSTON, R. E., and IRWIN, H. S. **The comparative extent of variation of free amino acids and certain "secondary" substances among *Cassia* species**. *Amer. J. Bot.* 48 (1), 1961 (35–9). 15 refs. O.B.D.

From chromatographic tests on 5 species of *Cassia* belonging to 4 sections of the genus, it seems that interspecific variation in free amino acids is less promising for taxonomic comparisons than variation in 'secondary' substances, i.e. a heterogeneous group of substances visible in ultraviolet light, visible light, and after treatment with a general reagent for phenols.

4044. PARIS, J. Akácmagok és csíranövényeik nukleinsavfoszfor tartalma. **[Nucleic-acid content of *Robinia* seed and seedlings.]** *Erdö* 9 (11), 1960 (416–20 + smries. in suppl.). 23 refs. [Hu.g.russ.]

An investigation into the place of this acid and P in growth and development.

4045. CRONENBERGER, L. Sur les constituants flavoniques des feuilles de différents prunus. **[The flavonic constituents of leaves of *Prunus* spp.]** *Bull. Soc. Chim. France* 1960 (1), (7). [F.] O.R.S.

Leaves of all species studied (*P. armeniaca*, *P. avium*, *P. cerasus*, *P. domestica*, *P. mahaleb*, *P. persica* and *P. spinosa*) contained *d*(+)catechin, leucocyanidin and taxifolin. The probable origin of these substances is discussed.

4046. JUNG, J. Über die Resistenz des Kambiums heimischer Laub- und Nadelhölzer gegen Bakterien und Pilze. **[The resistance of the cambium of native [German] conifers and deciduous species to bacteria and fungi.]** *Naturwissenschaften* 46 (23), 1959 (657). 6 refs. [G.] O.R.S.

Substances inhibiting growth of *Bacillus subtilis* and *Aspergillus luchuensis* have been found in the cambium of Spruce, Pine, Maple, Birch, Oak, Ash and Poplar.

4047. BARTELS, G. Enzymteste an Waldbäumen. **[Studies of enzymes in forest trees.]** *Abstr.* in *Silvae Genet.* 9 (5), 1960 (137). [G.]

The following enzymes were investigated in a number of species from samples extracted in the laboratory and examined spectrophotometrically: (1) malic dehydrogenase, the function of which resides in the citric-acid cycle; (2) diphosphofructose aldolase from the anaerobic part of the carbohydrate metabolism, and (3) glutamic-aspartic transaminase, which fulfils a function in the protein metabolism. These enzymes were found in seeds of many conifers, in pollen of both conifers and hardwoods, and in leaves of Poplars. Spruce seeds from the higher altitudes of the Harz Mts. had a higher enzyme activity than those from lower altitudes. In Larch pollen from a seed orchard, activity of individual enzymes was specific to the clone. Leaves of different Poplar clones also showed different enzyme activity. Above all it was apparent that the relationship of the activity of the enzymes to one another varies specifically with the clone.

4048. OZAKI, K., and WETTER, L. R. **The distribution of acylases in the seeds of higher plants.** *Canad. J. Biochem. Physiol.* 38 (9), 1960 (929–33). 14 refs. O.R.S.

The presence of aminoacylase(s) in the seeds of a number of species (including *Pinus banksiana*, *Betula papyrifera*, *Quercus alba*, *Ulmus americana*, and *Fraxinus lanceolata*), belonging to 25 families, was demonstrated.

4049. SCHWIMMER, S., and KJÆR, A. **Purification and specificity of the C-S-lyase of *Albizzia lophantha* [seed endosperm].** *Biochem. biophys. Acta* 42 (2), 1960 (316–24). 20 refs. [E.e.] O.R.S.

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See also Nos. 4044, 4127, 4163 *et seq.*, 4372, 4379–86, 4421–2, 4646, 4669, 4714, 4725–6, 4738–9, 4909.

4050. CANNY, M. J. **The rate of translocation.** *Biol. Rev.* 35 (4), 1960 (507–32). 45 refs. O.R.S.

Much of the information cited from literature relates to trees.

4051. HARRIS, J. M. **Water-conduction in the stems of certain conifers.** *Nature, Lond.* 189 (4765), 1961 (678–9). 1 ref.

In a laboratory study at Whakarewarewa, New Zealand, on the rate of flow of water through sapwood samples of *Pseudotsuga taxifolia*, *Pinus nigra*, and *P. radiata*, the effective water-conducting areas were determined by using aqueous solutions of various dyes. It was observed that water flow in the direction of the grain was restricted to the early wood, and that the late wood only became coloured, if at all, by later diffusion of dye, especially along wood rays. Separate examination of early and late wood from freshly cut trees showed the early wood to be 95% saturated with water, vs. only 65–70% for the late wood. Safranin dye injected into living trees was also shown to move along the early wood, the late wood only becoming stained some distance behind the limits of dye movement. These phenomena were observed from June (mid-winter) to February, and although resin flow in the Pines interfered with dye-injection experiments in the spring, laboratory studies of water flow and % saturation gave the same results at all times. In the species examined, it therefore appears that the late wood is not an effective water-conducting tissue, owing to its low degree of saturation with water. It is possible that the structure of the bordered pits in late wood prevents effective aspiration when an air bubble forms in a tracheid, so that the columns soon break down. In considering water flow in these trees, it seems that continuity between the transpiring leaves and the roots may only be possible along those growth-layers penetrated by the traces of living needles. Growth-layers interior to these are isolated by non-conducting bands of late wood. [Cf. *F.A.* 15 No. 629.]

4052. KULIKOV, N. V. Nakoplenie Co^{60} v osenne-zimnee vremja i raspredelenie ego v sejancah berezy. **[Accumulation of Co^{60} in autumn and winter, and its distribution in seedlings of *Betula verrucosa*.]** *Bot. Ž.* 45 (10), 1960 (1549–52). 20 refs. [Russ.]

Co^{60}, in the form of a $CoCl_2$ solution, was applied in a channel 10 cm. deep dug round and 18–20 cm. away from each of three similar saplings 6–7 years old, growing in natural conditions. The dosage, applied in early Oct. (i.e. after growth cessation and leaf-fall), was ca. 20 millicuries/plant. Samples of the branches were taken in late Oct. and early Jan. (i.e. 20 and 90 days after the application of Co^{60}), and one sapling was dug up for analysis in the following July. Other vegetation near by was also sampled and analysed. Results are tabulated. It was found that Birch roots, though in their autumn/winter 'dormant' state, do not stop absorbing. The Co^{60} was stored mainly in the leaves; less was found in the branches and bark, and least of all in the stemwood. Though Co is one of the least mobile elements in the soil, it moves along root systems to a considerable distance from the point of application.

4053. ZIMMERMANN, M. H. **Movement of organic substances in trees: photosynthates are translocated in a layer of bark only a fraction of a millimetre thick.** *Science* 133 (3446), 1961 (73–9). 36 refs. O.R.S.

A review covering structural organization of bark, significance of callose, methods of conducting physiological experiments, nature of sieve-tube substances, and the mechanism of translocation.

4054. ZIMMERMANN, M. H. **Longitudinal and tangential movement within the sieve-tube system of White Ash (*Fraxinus americana* L.).** *Beih. Z.*

Schweiz. Forstver. No. 30, 1960 (289–300). 16 refs. [E.e.g.]

The full version of a shorter paper already noticed [see *F.A.* 22 No. 1400].

4055. BEYSEL, D. Vergleichende Transpirationsmessungen an *Pinus nigra* Arnold und *Pinus silvestris* L. **[Comparative measurements of transpiration in *P. nigra* and *P. sylvestris*.]** *Ber. Dtsch. Bot. Ges.* 73 (9), 1960 (429–41). 14 refs. [G.g.] O.B.D.

Measurements of transpiration and osmotic pressure were made on (1) *Pinus nigra*, and (2) *P. sylvestris* on 4 sites in the Loibl forest district, Carinthia. It was found that 1-year-old needles of both species transpire less than 2- and 3-year-old needles. Comparisons of transpiration in 1- and 2-year-old needles showed, on all sites, definitely higher values for (2) than (1). Values for osmotic pressure also were higher and showed greater diurnal fluctuations in (2) than in (1). Average daily total transpiration in (2) was 21% higher in 1-year-old needles and 50% higher in 2-year-old needles than in needles of the same age in (1).

4056. SAUTIN, V. I. Izučenie intensivnosti transpiracii rannej i pozdnej form duba *Quercus robur* L. **[Study of the rate of transpiration of early and late forms of *Q. robur*.]** *Bot. Ž.* 46 (2), 1961 (286–90). 13 refs. [Russ.]

From measurements in 1951–52, tabulates data on the transpiration of *Q. r.* vars. *praecox* and *tardiflora* in various forest types in Belorussia [cf. *F.A.* 21 No. 4059]. On sites where it was the more at home, each variety had a greater transpiration rate (and better growth) than the other. Var. *praecox* had the better height and diameter growth in Oak/Hornbeam/Ash and Oak/Hornbeam/*Aegopodium* types, var. *tardiflora* in Pine/Oak types; in Oak/Hornbeam/*Oxalis* types there was little difference. Var. *tardiflora* is more heat- and light-loving, and less demanding as regards soil moisture. [Cf. *F.A.* 22 No. 4237.]

4057. POLLOCK, B. M. **Studies of rest period. III. Respiratory changes in leaf primordia of Maple buds during chilling.** *Plant Physiol.* 35 (6), 1960 (975–7). 7 refs. O.R.E.

Measurements were made of respiration rate [r.r.] and respiratory response to 2,4-dinitrophenol at intervals during chilling and warm storage on leaf primordia from *Acer saccharinum* buds. The r.r. of buds from chilled trees rises as a result of previous low-temperature exposure which breaks rest; respiration of unchilled buds drops during the same period. Dinitrophenol increases r.r., the increase becoming greater with length of storage but always being less in chilled than in unchilled buds. Thus, the efficiency of utilization of the respiratory enzyme system always remains higher in organs approaching growth than in those in which the rest period is not broken. This situation is similar to that in embryonic leaf primordia from Cherry seeds, and suggests that it may be a more general phenomenon. *From author's summary.*

4058. ŻELAWSKI, W. Przyczynek do poznania roli owocni i łupiny nasiennej w wymianie gazowej nasion buka. **[On the role of the pericarp and testa in the gas exchange of Beech mast.]** *Sylwan* 104 (11), 1960 (69–78). 11 refs. [Pol.russ.e.]

Reports tests on mast (*a*) whole, (*b*) without the pericarp, and (*c*) with the testa damaged or removed. These showed that the pericarp is easily penetrable by water vapour and O, and that the testa does somewhat reduce O uptake, but cannot prevent rapid changes in seed moisture content. Because of this, the seeds can dry out very quickly, whence, probably, the loss in viability during storage.

4059. SAITO, Y., and OGASAWARA, R. **[Studies on the respiration of the roots of *Salix gracilistyla* Miq.]** *Transactions of the Tottori Society of Agricultural Science, Tottori* 12, 1960 (132–6). 18 refs. [Jap.jap.e.] C.G.B.

Studies were made on roots developed from cuttings put in water. Results were: (1) Respiratory consumption per dry-weight unit of roots decreased with increasing length and was highest in the apical segment. (2) Optimum temperature for respiration changed as the experiment proceeded, from 40° C. in the early stages, to 30° at 24 hours, and 25° after 48 hours; the true optimum is probably ca. 25°. The response of respiration to temperature was not always the same as the response of growth. (3) The addition of IAA-K or NAA-Na (both 0·01–100 p.p.m.) reduced root growth but had no effect on respiration. (4) Respiration was high in the range pH 4·5–6·0 and the optimum pH for respiration and root growth nearly coincided.

4060. POLSTER, H., WEISE, G., and NEUWIRTH, G. Ökologische Untersuchungen über den CO_2-Stoffwechsel und Wasserhaushalt einiger Holzarten auf ungarischen Sand- und Alkali ("Szik"-) Böden. **[Ecological researches on the CO_2 balance [net assimilation] and water economy of some tree species in sand and alkali soils in Hungary.]** *Arch. Forstw.* 9 (11), 1960 (947–1014). 63 refs. [G.g.russ.e.]

[Cf. *F.A.* 20 No. 4141.] Photosynthesis, respiration, and transpiration, in various parts and aspects of the crown, and in various stations of the tree are described in detail with many graphs for *Robinia pseudoacacia* and *Populus alba* (with its form *laurifolia*) on sand dunes, and for *Quercus cerris* and *Q. robur* on szik soils and, in lesser degree, for *Acer tataricum*, *Crataegus monogyna*, *Fraxinus excelsior*, *Pyrus communis*, *Juniperus communis* and *Pinus nigra*. The object of the study, carried out by a team from Tharandt through August 1959, was to test the silvicultural admissibility of species to sites by their dry-matter production and transpiration efficiency. The *Robinia* passed both these tests in the shelter of Pine stands and failed both on dunes in the open. The outstandingly xerophytic nature of the Juniper is shown. The Pine, with high summer temperatures, dry soil and unlimited transpiration on extreme days can show a negative CO_2 balance, surprising in view of its over-all increment. *Populus alba* f. *laurifolia* is superior to *P. alba* on the most drought-hazardous sites (dune summit and ridge). Its suitability for replacing Robinia on the worst Robinia sites is confirmed. The *Crataegus* showed more intense photosynthesis than any other species tested except the White Poplar and its form. *Quercus robur* excelled *Q. cerris* in assimilation during high summer. A field laboratory equipped with automatic recording apparatus was used. Measurements made included CO_2 and transpiration water (by infra-red gas analysers), evaporation, light, total radiation, temperature, humidity, wind speed, stomatal opening (by infiltration and Lindbauer's scale), dry substance in cell sap (refractometer), water deficit (severed leaf weight), and ratio of cross-section area of petiole xylem to the leaf weight and area (for xeromorphism).

4061. Roussel, L. Les arbres "toujours verts". **["Evergreen" trees.]** *Bull. Soc. For. Franche-Comté* 31 (5), 1961 (255–60). [F.]

Reviews (without exact bibliographical references) research on assimilation and photosynthesis by evergreen species in winter, with particular reference to variation according to latitude and altitude.

4062. Godnev, T. N., and Rotfarb, R. M. K voprosu o fotosinteze i obrazovanii hlorofilla pri otricatel′nyh temperaturah. **[Photosynthesis and chlorophyll formation at temperatures below 0° C.]** *Dokl. Akad. Nauk SSSR* 134 (4), 1960 (963–4). 9 refs. [Russ.] A.P.B.

Young shoots from 4- to 5-year-old Spruce were kept in a chamber at -14° C. for some hours, and then supplied, at the same temperature, with $C^{14}O_2$ for 2 hours. The shoots were then fixed immediately by immersion in boiling water, and the tissues tested for radioactivity. Recovery of C^{14} in chromatographically isolated sugars indicated that fairly rapid photosynthesis had occurred at -14°. No radioactivity, however, was detectable in the chlorophyll pigments similarly isolated; longer experiments would be needed to determine whether their formation is very slow, or whether it cannot take place at this temperature.

4063. Šahov, A. A., Hazanov, V. S., and Stanko, S. A. Ob istinnyh spektral′nyh svojstvah rastenij. **[The true spectral properties of plants.]** *Bot. Ž.* 46 (2), 1961 (222–33). 7 refs. [Russ.russ.e.]

Describes a new photo-integrating apparatus developed by the authors for determining the spectral properties of plants, and experiments in its use to determine the relation of these properties to the intensity and composition of solar radiation. Leaves of some tree species were among those studied. When the energy of solar radiation was reduced, and its composition changed, the spectral properties of the leaves were extremely labile in the near infra-red part of the spectrum. The dependence of the spectral properties on the nature of the radiation source was proved by comparing energy absorption in sunlight and under electric light. The presence of anthocyanins was associated with greater absorption of radiant energy (particularly green rays), and the growing of plants in coloured light (under acetate filters) caused considerable changes in their spectral properties. [Cf. *F.A.* 22 Nos. 4081–2.]

4064. Hotjanovič, A. V. Izmenenie optičeskih svojstv list′ev duba *Quercus rubra* L. pod vlijaniem gibberellinovoj kisloty. **[Changes in the optical properties of *Q. rubra* leaves under the influence of gibberellic acid.]** *Bot. Ž.* 46 (1), 1961 (131–2). 9 refs. [Russ.]

Acorns were soaked for 24 hours in a solution of gibberellic acid (100 mg./litre) and were then grown in laboratory conditions under artificial light. After 40 days, when the plants were ca. 25 cm. high, the reflection, transmission, and absorption of light by the leaves were determined. The results are graphed. Absorption was less, and reflection and transmission greater, in all parts of the spectrum investigated (400–750 mμ), in treated than in untreated plants. The change in the optical properties of the leaves of treated plants was greatest in the yellow-green (550 mμ) part of the spectrum. This difference is explained by the reduction in contents of chlorophyll and carotenoids in the leaves of treated plants. Chlorophyll content was 5·5 mg./g. (green weight) and 4·8 mg./100 sq. cm. (leaf area) in controls, vs. 2·7 and 2·1 respectively in treated plants; content of carotenoids was 1·7 mg./g. and 1·5 mg./100 sq. cm. in controls, vs. 1·0 and 0·7 respectively in treated plants.

4065. Kolesničenko, M. V. K voprosu o biohimičeskih vzaimovlijanijah drevesnyh porod. **[Biochemical interrelationships of woody species.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (37–42). 6 refs. [Russ.]

A slightly more detailed version of work already noticed [see *F.A.* 22 No. 111].

4066. Skvorcov, S. S. Dinamika vydelenija letučih veščestv u nekotoryh drevesnyh rastenij. **[Dynamics of the liberation of volatile substances in certain woody plants.]** *Bot. Ž.* 46 (1), 1961 (51–60). 23 refs. [Russ.e.]

Studies were made on leaves of Poplar, Oak, Birch, *Prunus padus*, etc. in order to determine (1) the variations in the liberation of volatile organic compounds from intact leaves; (2) the content of aldehydes in volatile substances given off by intact and crushed leaves; and (3) the content of volatile organic acids in leaves during the growing season. The method used was absorption of the volatile organic substances by concentrated H_2SO_4 and subsequent oxidation to CO_2. The rate at which the compounds were given off from intact leaves varied with species, but in all species it fell towards the end of the growing season. The most widely represented volatile substances produced by crushed leaves were aldehydes, especially acetaldehyde; these substances possess an anti-microbial action, and their prolonged production after the cells are damaged is regarded as a manifestation of natural, non-specific immunity. The content of volatile organic acids was highest in young leaves in all species, but particularly in those of Oak. Of the complex of volatile substances possessing an anti-microbial effect, aldehydes were the most important in Birch and Poplar, and acids in Oak.

4067. Gardner, I. C., and Leaf, G. **Translocation of citrulline in *Alnus glutinosa*.** *Plant Physiol.* 35 (6), 1960 (948–50). 11 refs. O.R.E.

[Cf. *F.A.* 20 Nos. 248, 2928.] Young Alders absorbed $HC^{14}O_3$ from the root medium and incorporated its C into aspartic and glutamic acids, glutamine and citrulline. After 4 hours, citrulline was the only amino acid to contain C^{14} in the leaves, though glutamic acid in the stem also showed a weak activity. Glutamine was found in the roots but did not appear to undergo translocation. These results are compatible with the view that citrulline is the main vehicle for the translocation of N in the Alder. *Authors' summary*.

4068. ELIASSON, L. **The influence of growth substances on the formation of shoots from Aspen roots.** *Physiol. Plant., Copenhagen* 14 (1), 1961 (150–6). 13 refs. [E.e.]

Root segments of *Populus tremula* were treated with growth substances and grown in light for 4 weeks. Control segments formed abundant suckers in this period. The growth substances inhibited shoot formation, the phenoxy compounds (*a*) being more active than (*b*) IAA, (*c*) NAA, and (*d*) 2,3,6-TBA. Sensitivity to (*a*) was greatest in summer, when the ability to form suckers was least. At high concentrations of (*a*), necrotic symptoms connected with rapid microbial decomposition gradually appeared. This response was caused by 2,4,5-T at considerably lower concentrations than by other substances. A narrow range of concentrations of (*a*) caused a proliferation of tissues in the bark, 2,4-D, MCPA, and 4-ClPOA (CPA) being the most active. Growth of wound callus was stimulated by (*b*), (*c*), and most of all (*d*).

4069. EINSPAHR, D. W., and BUIJTENEN, J. P. VAN. **The influence of gibberellic acid on growth and fiber length of Quaking Aspen.** *For. Sci.* 7 (1), 1961 (43–51). 9 refs.

[Cf. *F.A.* 19 No. 3827.] Greenhouse trials indicated that Aspen growth was affected by spray and lanolin paste treatments, rapid responses and overstimulation being got by spraying every 2 weeks with 500 and 100 p.p.m. Field trials showed that these early height-growth advantages disappeared by the end of the growing season. Controls were also generally more resistant to dieback and mortality, superior in root development and less subject to leaf discoloration and necrosis. Seedlings from the lanolin paste and from 10-p.p.m. treatments had slightly, but not significantly, longer fibres than controls. All other treatments showed shorter fibres.

4070. SWAN, H. S. D. **The influence of gibberellic acid on the growth and development of three hybrid Poplars. Final report.** *Woodl. Res. Index Pulp Paper Res. Inst. Can.* No. 124, 1961. pp. 18. 25 refs.

Following a preliminary field trial [see *F.A.* 19 No. 3827], a more extensive field trial was made in the same way with gibberellic acid in lanolin paste on *Populus* × '*canadensis*' cv. 'Serotina 2', *P.* × *generosa* cv. '8/33', and *P.* × '*canadensis*' cv. 'IH-65A'. The plots were left for one or two growing seasons, and the plants were then harvested, weighed and measured. Conclusions were that a 1% gibberellic-acid paste can be used to increase height growth of these hybrid Poplar cuttings during the first growing season, but that this effect is almost certainly accompanied by a reduction in total leaf area in the next season and, therefore, by a lowering of the growth potential. Stem weight is not increased, and may be reduced. Accordingly, the use of gibberellic-acid paste, at the concentrations tested (0·01, 0·1 and 1·0%), cannot be recommended.

4071. KONOVALOV, I. N., ŽUJKOVA, I. V., and ZINOV'EV, L. S. Vlijanie gibberellovoj kisloty na osobennosti rosta i zimostojkost' drevesnyh rastenij. **[Effect of gibberellic acid on the growth and winter-hardiness of woody plants.]** *Bot. Ž.* 45 (12), 1960 (1721–31). 14 refs. [Russ.russ.e.]

Discusses and illustrates the nature of shoot formation in young *Tilia cordata* (1–5 years old), and the effects of applying an aqueous solution of gibberellic acid (0·03%) to the axillary buds of the top 3 or 4 branches at the rate of a drop a day for 20 days from July 2, a date when shoot growth had already ceased. Gibberellin induced the resumption of growth, and, when applied in the following spring, increased the growth rate. It caused the greatest growth from the axillary buds at the ends of the upper shoots and had little or no effect on the buds on the lower part of the shoots. It did not induce any significant changes in the rhythm of growth, but by prolonging and stimulating growth during the growing season it reduced the frost resistance of young plants. It is concluded that gibberellin cannot initiate growth but only stimulates or retards growth processes already inherent in the plants.

4072. WESTING, A. H. **Peroxidase distribution in the leaders of erect and inclined *Pinus strobus* seedlings.** *Amer. J. Bot.* 47 (8), 1960 (609–12). 19 refs. O.B.D.

The growth changes that occur when a conifer stem is inclined, suggest that a transverse asymmetry of auxin distribution is somehow involved in the response. Considering the increase in ability to produce lignin in compression wood and the fact that lignin arises through the polymerization of coniferyl alcohol or similar monomer in the presence of a peroxidase, a study was made of peroxidase activity in *Pinus strobus* seedlings 8–12 years old, subjected to one of 3 treatments for various periods: (1) the tree was bent so that its leader was placed in a horizontal position; (2) the same as (1), but the apical 5 mm. was excised and the leaves of the leader removed; (3) the same as (2), but an additional 5 mm. was excised from the apical end of the leader at weekly intervals. In leaders of *P. strobus* a longitudinal gradient of peroxidase activity was found, that was independent of stem inclination. Inclination of intact leaders had no effect on the transverse distribution of peroxidase activity, but when the leaders were decapitated and defoliated a transverse gradient, increasing from the upper side to the lower, did develop. Applications of α-NAA prevented this transverse redistribution from occurring. Mutilation also resulted in an increase of the over-all level of peroxidase activity in the leaders.

4073. GROSSET, G. Ė. K izučeniju ėkologii kedrovogo stlanika (*Pinus pumila* Rgl.) (Mehanizm aktivnogo poleganija pri nastuplenii morozov). **[A study of the ecology of *P. pumila*. (The mechanism of active "lying down" with the onset of frosts).]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody* (*Otd. Biol.*) 64 (2), 1959 (85–96). 37 refs. [Russ.e.] C.G.B.

On the adverse sites where *P. pumila* commonly grows, its stem is more or less prostrate (though in very favourable conditions it may be almost upright); the ascending branches, which may form thickets 4–5 m. high in summer, become prostrate with the onset of the frosts and lie protected by snow through the winter, resuming their former position with the warmer weather. From observations in the field, together with experiments on detached branches and studies of the anatomy and shrinkage properties of the wood, the author concludes that this active movement is caused by freezing of the wood, which results in moisture loss from the tracheid walls combined with much greater longitudinal shrinkage of the under (compression-wood) side of the branches than on the upper. [Cf. *F.A.* 21 No. 4030.]

4074. SAVČENKO, M. I. Strukturnye osobennosti hloroplastov semennyh rastenij. **[Structural features of the chloroplasts in angiosperms.]** *Bot. Ž.* 45 (7), 1960 (951–67 + 2 sets of drawings). 65 refs. [Russ.e.]

Explains the structural features of chloroplasts in 50 species of angiosperms and in a few gymnosperms (the species studied include trees and Bamboos), describes the ontogeny of chloroplasts in different stages of leaf formation, and also the relations between chloroplasts and other organoids of the plant cell.

163. Embryology

See also No. 4218.

4075. KONAR, R. N. **The morphology and embryology of *Pinus roxburghii* Sar. with a comparison with *Pinus wallichiana* Jack.** *Phytomorphology* 10 (3), 1960 (305–19). O.B.D. [Cf. *F.A.* 21 No. 1445.]

4076. NARAYANA, L. L. **Studies in Burseraceae —II.** *J. Indian Bot. Soc.* 39 (3), 1960 (402–9). 12 refs. O.B.D.

A study of the floral anatomy and embryology of *Bursera serrata*, and the embryology of *Garuga pinnata* and *Boswellia serrata*.

4077. JOSHI, P. C. **Morphological and embryological studies in the family Santalaceae. V. *Osyris wightiana* Wall.** *Phytomorphology* 10 (3), 1960 (239–48). 10 refs. O.B.D.

164. Morphology

See also Nos. 4075–7, 4205, 4213–4, 4324, 4366, 4698, 4700–3, 4868.

4078. FRAMPTON, C. V. **Some aspects of the developmental anatomy of the 'long' shoot in *Larix decidua* Mill., with particular reference to seasonal periodicity.** *New Phytol.* 59 (2), 1960 (175–91 + 4 photos). 20 refs. O.R.S.

Describes the structure and behaviour throughout the yearly growth cycle of the terminal buds of "long" shoots. These grow from the terminal buds and from a few axillary buds on long shoots of the previous year, whereas "short" shoots, with a fascicle of leaves, grow from the other axillary buds. Within the bud, two regions of growth (illustrated) may be recognized, the "axial" portion rising vertically on the centre of the bud and terminating in the apical cone, with the "fascicular" portion extending somewhat, laterally, at the base and surrounding it. The capacity of a bud to grow into a long shoot depends on the presence within it of the axial portion and is thus determined in the season before the opening of the bud. Weaker branches of the tree bear smaller terminal buds in which the axial portion is reduced or absent.

4079. GAUSSEN, H. Brachyblastes et pseudophylles de pin. **[Brachyblasts and pseudophylls of Pine.]** *Trav. Lab. For. Toulouse* 1 (6) Art. 7, 1961. pp. 10. 2 refs. [F.]

The author justifies his use of the distinction between "pseudophylls" and "euphylls" of the brachyblasts of *Pinus*.

4080. BARANOVA, E. A. Formirovanie i razvitie pazušnyh i spjaščih poček u ėvkalipta. **[Formation and development of axillary and dormant buds in *Eucalyptus*.]** *Bot. Ž.* 45 (8), 1960 (1169–75). 7 refs. [Russ.russ.]

Studies microscopically the formation and development of axillary buds from seed germination to the age of 3 years in glasshouse-grown *E. cinerea* (opposite-leaved) and *E. calophylla* (alternate-leaved) and also the structure and growth of dormant buds. Exogenously developed buds grow into axillary shoots, some of which become normal side branches, others stopping development after forming two pairs of leaves and usually falling after a few months. Endogenous buds are adventitious, typical dormant buds, consisting of a growing point and two or four rudimentary leaves; these buds are connected to the conducting system of the stem by a "bud-stem", consisting of spiral vessels and tracheids, and capable of extension but not of thickening.

4081. ŠUL'GIN, I. A. Ob optičeskoj harakteristike kseromorfnosti i sukkulentnosti list'ev rastenij. **[The optical characteristics of leaf xeromorphism and succulence.]** *Dokl. Akad. Nauk SSSR* 134 (4), 1960 (972–5). 3 refs. [Russ.] A.P.B.

From studies on several different kinds of plants (some woody), concludes that the *R/T* ratio (reflection/transmission of radiant energy) can be regarded as a new, simple, and more general characterization of the degree of xeromorphism of leaf structure. [Cf. *F.A.* 22 Nos. 4063–4.]

4082. DADYKIN, V. P., and BEDENKO, V. P. O svjazi optičeskih svojstv list'ev rastenij s vlažnost'ju počvy. **[The relationship between the optical properties of plant leaves and the soil moisture content.]** *Dokl. Akad. Nauk SSSR* 134 (4), 1960 (965–8). 23 refs. [Russ.] A.P.B.

[Cf. *F.A.* 21 No. 4024.] Graphs the spectral transmission and reflection of solar radiation by leaves of *Tilia cordata* and *Quercus robur* grown in vessels of soil kept at 20, 40, 60 and 80% of maximum water-holding capacity [m.w.c.]. The curves for 60 and 80% m.w.c. coincided. In all cases, reflection and transmission were least at 60 and 80% m.w.c. and increased with decreasing soil moisture. These studies offer fresh confirmation of the thesis that the optical properties of leaves depend on environmental factors.

4083. Broekhuizen, J. T. M. Veranderingen in de bladvorm van enige populierklonen gedurende de vegetatieperiode. **[Variations in the leaf shape of some Poplar clones during the growth season.]** *Commun. Inst. For. Res. Agric. Univ. Wageningen* No. 3, 1961. pp. 35. 4 refs. [Du.e.]

Measurements of midrib length, length and maximum width of leaf, width at various points along the midrib, distance between maximum width and base of midrib, and nerve angle were made for all leaves of 1-year shoots of well grown 3-year-old trees of *Populus* × *canadensis* cvs. 'Gelrica', 'Marilandica', 'Regenerata' and 'Serotina'. In the period up to late June or early July, there were variations in the measurements, but after the 17th leaf most characteristics remained fairly constant, only nerve angle continuing to decrease slowly. Although leaf shape developed along similar lines in all clones, certain differences were found, nerve angle being a good character for identification. Summer leaves, because of their constant characters, are best for identification. Certain of the relations between characters differed significantly in different clones, but further research will be needed to confirm that the indices of relationship do not vary from year to year.

4084. Critchfield, W. B. **Leaf dimorphism on *Populus trichocarpa*.** *Amer. J. Bot.* 47 (8), 1960 (699–711). 39 refs. O.B.D. [Cf. *F.A.* 22 No. 1423.]

4085. Rao, V. S., Sirdeshmukh, K., and Sardar, M. G. **The floral anatomy of the Leguminosae.** *Journal of the University of Bombay, Bombay* 26 (5*B*), 1958 (65–138). 26 refs. L.S.

Describes and illustrates inflorescences of 7 Mimosoideae, 13 Caesalpinioideae and 23 Papilionatae, discussing phylogeny and taxonomy.

4086. Yamazaki, T., and Takeoka, M. **[Electron-microscope investigations on the surface structure of the pollen membrane, based on the replica method. V. Especially on the pollen of genus *Quercus*.]** *J. Jap. For. Soc.* 41 (4), 1959 (125–9 + 4 plates). 10 refs. [Jap.jap.e.*e*.]

Describes and illustrates the fine surface structure of pollen of 12 *Quercus* spp., as a result of which 6 (*Q. salicina*, *Q. paucidentata*, *Q. myrsinaefolia*, *Q. glauca*, *Q. acuta* and *Q. gilva*) are allotted to the subgenus *Cyclobalanopsis*, and 6 (*Q. dentata*, *Q. variabilis*, *Q. acutissima*, *Q. mongolica* var. *grosseserrata*, *Q. aliena* and *Q. serrata*) to the subgenus *Lepidobalanus*. [Cf. *F.A.* 21 No. 102.]

4087. Risch, C. Die Pollenkörner der Salicaceen. **[The pollen grains of Salicaceae.]** *Willdenowia, Berlin-Dahlem* 2 (3), 1960 (402–9). [G.] From *abstr.* in *Biol. Abstr.* 36 (6), 1961 (No. 18435).

Pollen grains of *Populus* and *Salix* are described, with lists giving the dimensions of pollen grains of 14 *Populus* spp. and >60 *Salix* spp., and shorter lists of *Salix* spp. having abnormally shaped pollen grains.

4088. Sjafei'e, I. Daftar ichtisar himpunan tjontoh² bidji dan buah dari beberapa djenis pohon dan pupuk hidjau. **[Summary list of the collection of seeds and fruits of some tree and green-manure species.]** *Rep. For. Res. Inst., Bogor* No. 80, 1959. pp. 74. 4 refs. [Indon.]

The list, comprising 987 species, specimens of which were sent to the Indonesian Forest Research Institute from 1918 to date, is in two parts arranged (1) by families, (2) by Latin names of species. Synonyms and Indonesian names are also given.

4089. Allen, G. S. **A method of distinguishing Coastal from Interior Douglas Fir seed.** *B.C. Lumberm.* 44 (8), 1960 (26 . . . 30). 2 refs.

The diagnostic features (illustrated in 16 photographs) in order of reliability are: a longer, more pointed and pinched-in seed tip in the Coastal (*C*) type; (*C*) seed longer and narrower, Interior (*I*) seed, more triangular; the tougher surface gives the (*C*) seed a darker, duller appearance without the sheen of (*I*) seed; (*C*) seed has a more pronounced ridge on the dark side and is wrinkled near the tip. (*I*) seed is often brighter, commonly striped; frequently these stripes are wavy and continued into the wings. Tests on 24 provenances with coded identification numbers were correctly classed on the above characters. Black-and-white prints and colour transparencies can be supplied at cost by the author (Faculty of Forestry, University of British Columbia).

4090. Białobrzeska, M., and Truchanowiczówna, J. Zmienność kształtu owoców i łusek europejskich brzóz (*Betula* L.) oraz oznaczanie ich w stanie kopalnym. **[The variability of shape of fruit and scales of European Birches (*Betula* L.) and their determination in fossil material.]** *Monographiae Botanicae* 9 (2), 1960 (1–85). [Pol.e.] From *abstr.* in *Biol. Abstr.* 36 (8), 1961 (No. 25108).

165.3/7. Heredity, Genetics and Breeding; Variation

See also Nos. 4047, 4056, 4089, 4138, 4152, 4160, 4164–5, 4177, 4225, 4237, 4355–9, 4369–75, 4751–2, 4997, 5064.

4091. Matthews, J. D. **Report to the Government of India on a program of forest genetics and forest tree breeding research.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1349, 1961. pp. 53. 32 refs.

The terms of reference of the assignment were "to advise the Government of India, more specifically the Forest Research Institute at Dehra Dun, regarding the establishment of a Section of Forest Genetics". This also involved the formulation of a programme of research and training of local personnel in the initiation of genetics investigations.

4092. RUBNER, K. Zur forstlichen Rassenfrage. Sammelreferat über das Schrifttum von 1957 bis 1960 ohne Züchtungsfragen und Pappelsorten. **[The question of [tree] races in forestry. A review of literature from 1957 to 1960, excluding questions of breeding and Poplar varieties.]** *Forstarchiv* 32 (3), 1961 (45–50). 71 refs. [G.]

The review covers tree species grown in Germany. A general introduction is followed by separate sections on coniferous and deciduous trees, each subdivided by genus or species.

4093. KING, J. R. **The freeze-drying of pollens.** *Econ. Bot.* 15 (1), 1961 (91–8). 16 refs.

[Cf. *F.A.* 21 No. 4047.] Quotes data from trials of pollen of monocotyledons, Convolvulaceae, Moraceae, Rosaceae, Solanaceae, and *Pinus taeda* to show the successful application of freeze-drying for the storage of pollen, and illustrates a suitable portable refrigerator. The process consists of freezing (at ca. $-60°$ C.), evacuation (50–250 mm. Hg), drying by sublimation of the ice formed, and storing at room temperatures under N. It is essential that the initial rate of freezing should be slow, so that crystallization may be wholly or predominantly extra-cellular before rapid rates of freezing are reached and crystal nucleation becomes general. The physiology of the recovery of the microspore from the freeze-dried state is discussed, and further fields for research indicated. Ordinary postal packets of a treated pollen have been dispatched from America to New Zealand and back without loss of viability, and a world pollen-exchange programme is confidently expected.

4094. CALLAHAM, R. Z., and DUFFIELD, J. W. **Stretching the pollen supply.** *J. For.* 59 (3), 1961 (204–7). 11 refs.

In studies on the economical use of pollen, a range of dilutions with dead pollen containing 100, 50, 10 and 2% viable pollen was used in controlled pollinations of *Pinus jeffreyi* and *P. ponderosa*. Fragmentary results indicate that dilution with an equal amount of dead pollen does not reduce production of viable seed. Greatest fertility per unit of pollen may be achieved with only 10–30% viable pollen. Neither the development of conelets to mature cones nor the total production of sound plus hollow seed was affected by dilution. Wind-pollinations always produced more sound seed than controlled pollinations, the reasons for this not being determined. [Cf. *F.A.* 20 No. 1465.] *From authors' summary.*

4095. STANLEY, R. G., PETERSEN, J., and MIROV, N. T. **Viability of Pine pollen stored 15 years.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 173, 1960. pp. 5. 10 refs.

Samples of pollen from 7 Pine species were collected at the Institute of Forest Genetics in 1945, and stored under varying relative humidities at 0° and 5° C. After 15 years, pollen stored at 10% r.h., whether at 0° or 5°, was still viable, but germination % and tube length were greater in the samples stored at 0°. Pollen stored at $>10\%$ r.h. was not viable. Data for each species are tabulated. [Cf. *F.A.* 15 No. 3262; 22 No. 140.]

4096. MANŽOS, A. M. Izučenie pH (kislotnosti) pyl'cy drevesnyh i kustarnikovyh porod. **[Studying the pH of pollen of tree and shrub species.]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (34–7 + 2 tbls.). 13 refs. [Russ.]

pH of pollen of *Fraxinus excelsior*, *Juniperus communis*, *Larix gmelinii* (one ordinary, one triploid), *L. sukaczewii*, *Prunus padus*, *Pinus mugo*, *P. monticola*, *P. sibirica* (one ordinary, one grafted on to Scots Pine), *P. sylvestris*, *Populus balsamifera*, *P. tremula*, *P.t.* var. *gigantea* (polyploid), *Quercus robur*, *Salix caprea*, *S. dasyclados* × *S. caprea*, *Syringa vulgaris*, and *Tilia cordata* was determined (by staining with neutral red) in the search for a simple means of determining pollen sterility or fertility. Tables show the pH values at three stages during the post-embryonic development of pollen (i.e. bud swelling, opening, flowering), and also of mature pollen at intervals during storage (in containers in a desiccator at 2° C.) for ≤ 5 months. It was concluded that: pH 4·7–7 indicated viable, whereas pH 7·4–8 indicated non-viable pollen; pollen becomes differentiated (fertile or sterile) in the stages of bud opening and flowering; and viability falls during storage, the rate varying with species.

4097. GERSHOY, A., and GABRIEL, W. J. **A technique for germinating pollen of Sugar Maple.** *J. For.* 59 (3), 1961 (210).

The pollen was placed on sugar agar in moist chambers in the conventional manner, but treated additionally with small concentrations of lipase, H_3BO_3, and $CaCO_3$. The effects of this treatment in prolonging tube growth are given.

4098. ROHMEDER, E. Bastardierung in der Gattung *Abies*. **[Hybridization in the genus *Abies*.]** *Abstr.* in *Silvae Genet.* 9 (5), 1960 (136–7). [G.]

In the Grafrath plantations, from 1950 to 1960, 35 different hybrid combinations have been obtained, using 10 different father species. Investigations on pollen revealed new facts about morphology and size, e.g. pollen of *A. veitchii* can be distinguished from all others investigated by its smallness. Many combinations showed marked hybrid vigour, e.g. *A. veitchii* × *A. alba*, *A. concolor* × *A. nordmanniana*, *A. concolor* × *A. grandis*, *A. concolor* × *A. procera*. With an *A. concolor* parent, marked hybrid vigour was almost always obtained; the hybrids were by no means uniform, but differed considerably in e.g. needle colour. Hybrids with long, pure green needles had the greatest growth vigour, and it was found that needle colour can be used as a criterion for growth vigour even at the seedling stage. The same criterion was applicable to natural hybrids between *A. concolor* and *A. nordmanniana*. The numerous hybrids obtained in the experiments were used to investigate the manner of inheritance of morphological, anatomical and physiological characters. Some hybrids are more tolerant of poor sites and are more frost hardy than the native *A. alba*.

4099. LEIBUNDGUT, H., and HELLER, H. Photoperiodische Reaktion, Lichtbedarf und Austreiben von Jungpflanzen der Tanne (*Abies alba* Miller).

[Photoperiodic reaction, light requirements and shoot development of young Silver Fir plants.] *Beih. Z. Schweiz. Forstver.* No. 30, 1960 (185–98). 10 refs. [G.f.]

A provenance study on 1–4 trees from 9 places in Switzerland indicates that rapid tests by exposure to varying photoperiods or light intensities could reveal considerable differences in provenance even within a comparatively small area. Hypocotyl lengths of seedlings (greatest for those grown under short-day conditions and not significantly different for those grown under 14 or 24 hours' daily illumination) were generally less in the Tessin and Grisons provenances (*D* and *E*) than in those from more northerly and lower-lying localities (*A*–*C*). In seedlings grown under different light intensities ($\frac{1}{10}$, $\frac{1}{4}$ and $\frac{3}{4}$ of full daylight), height growth was greatest at the lowest and least at the highest illumination, but dry-matter production of roots and aerial parts was greatest at the middle and least at the lowest illumination. Height growth was again less in (*D*) and (*E*) than in (*A*)–(*C*). Both in greenhouse tests with 3-year-old and open-air tests with 5-year-old plants, (*D*) and (*E*) showed earliest shoot development. In the greenhouse, long days and permanent light accelerated development by an average of 11 and 8 days respectively over short days, (*D*) and (*E*) reacting more than (*A*)–(*C*).

4100. LANGNER, W. Keimungsverlauf bei den Herkünften eines Provenienzversuches mit *Larix leptolepis* (Sieb. et Zucc.) Gord. **[Germination in provenances of *L. leptolepis*.]** *Silvae Genet.* 9 (6), 1960 (165–7). 6 refs. [G.g.e.f.]

Germination tests with seed from 22 German stands of Japanese Larch showed wide variations in rates of germination between the stands. No correlation could be found with altitude, mean annual precipitation, or temperature.

4101. HOLZER, K. Ergebnisse einer Fichtensämlingstestung in der Kulturkammer. **[Results of tests on Spruce seedlings in culture chambers.]** *Abstr.* in *Silvae Genet.* 9 (5), 1960 (137–8). [G.]

Seedlings raised from seed of 103 individuals were kept for 3 months in the laboratory under a 16-hr. day-length régime. Data were collected on: (1) length of (*a*) shoots, (*b*) hypocotyls, and (*c*) roots; (2) bud formation; (3) root branching; (4) number of cotyledons; and (5) fresh and dry weight of (*a*) seeds, (*b*) shoots, (*c*) hypocotyls, and (*d*) roots. Altitude above sea-level of the mother tree had an important effect on all these characters, particularly on the cessation of shoot growth, on (1*a*) and (1*b*), and on the moisture content of the assimilatory organs. The relationship of (1*c*) and (1*a*) to the total length is a valuable indicator of seed provenance. (5*a*) is also important, affecting particularly dry weight of the hypocotyl and shoot; it is also related to (4), which rises slightly with decreasing altitude and falls with increasing (5*a*). A further investigation on seedlings from 22 individuals kept for 4 months under different day-length régimes revealed particularly the dependence of cessation of shoot growth on day length and on the altitude of the provenance.

4102. LEHOTSKÝ, L. Vplyv nadmorskej výšky na kvalitu semena smreka obyčajného (*Picea excelsa* Link), borovice sosny (*Pinus silvestris* L.) a vývoj sadeníc borovice sosny v horských polohách. **[Effect of altitude on seed quality of *P. abies* and *P. sylvestris*, and on seedling development of *P. sylvestris* in the mountains.]** *Lesn. Čas.* 7 (1), 1961 (28–46). [Slovak.russ.g.]

Scots Pine seed was collected from 4–5 trees at sites of 600, 700, 870 and 1100 m. alt., and Norway Spruce seed from 7–12 trees at sites of 640, 800–860, 1000–1150, and 1400 m. alt. in Slovakia. Altitude affected seed quality more in Spruce than in Pine. Seed and cone quality were the better, the lower the altitude of the site. The Pine seed was sown in nurseries at 640, 750, 870, and 1050 m. alt. Measurement of seedling height at 2 years showed that, at each nursery, stem height decreased with increasing altitude of provenance, and also that height growth was best at the lowest nursery.

4103. FRÖHLICH, H. J. Untersuchungen über Benadelungsverhältnisse verschiedener Fichten-Provenienzen. **[Foliage relationships in different Spruce provenances.]** *Abstr.* in *Silvae Genet.* 9 (5), 1960 (138). [G.]

In a 35-year-old provenance trial area, containing 9 provenances of Spruce from its whole natural range in Germany, and from altitudes of 100–1200 m., the year's growth of needles for 3 consecutive seasons was estimated in 40 individuals of each provenance. No relationship with the altitude of the provenance could be established. Since, however, two of the surveys followed dry summers, the drought resistance as characterized by needle cast could be studied. Three groups were distinguishable: (1) low-altitude provenances from E. Prussia and E. Silesia with good drought resistance, (2) alpine provenances—drought-susceptible, and (3) an intermediate group from the Hercynian region. A parallel classification was possible in terms of self-pruning: (1) self-pruned more quickly than (2) or (3); (2), in particular, tended to retain the green crown down to ground level. In comparisons of needle weight and number of needles per cm. of shoot, very little difference could be found between provenances, but there were striking variations between individual trees.

4104. CALLAHAM, R. Z. **Observations on Pine susceptibility to weevils.** *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 51, 1960. pp. 12. 4 refs.

Further examines the variation in susceptibility shown by inter- and intraspecific hybrid Pine progenies to attack by *Cylindrocopturus eatoni*, as studied in 1949–50 [cf. *F.A.* 12 No. 961]. A study of mortality and frequency of attack showed that stems of progenies within an experiment were more or less uniformly affected, none escaping. Needle-feeding was heaviest on trees that later succumbed to attack, but stem attacks were most frequent on survivors. The scope and validity of observations in natural (i.e. uncontrolled) pest infestations is discussed.

4105. BATZER, H. O. **Jack Pine from Lake States seed sources differ in susceptibility to attack**

by the White-Pine weevil. *Tech. Note Lake St. For. Exp. Sta.* No. 595, 1961. pp. 2. 1 ref.

Examinations in 1958 and 1959 of a plantation of *Pinus banksiana*, comprising 30 seed sources, established at Chippewa National Forest, near Cass Lake, Minn., in 1953–54, showed damage by *Pissodes strobi* on up to 23% of trees. Highly significant differences in damage between seed sources were noted. Eight sources showed significantly (at 1% level) more damage than the local source, but none showed significantly less.

4106. ERICSON, B. **Studies of the genetical wood density variation in Scots Pine and Norway Spruce.** *Rapp. Avd. Skogsprod. SkogsforsknInst., Stockh.* No. 4, 1960. pp. 52. 32 refs. [E.e.sw.*sw.*]

In a study on trees from 90 plots of Pine and 171 of Spruce, all factors affecting ring width also affected density, but for trees of equal mean ring-width, basic density [b.d.] decreased with rising altitude and latitude. Regressions for computing b.d. from mean ring-widths and mean temperature for the period June–August were developed. The ratio, in %, of b.d. thus calculated, to the observed b.d.—termed relative b.d. [r.b.d.]—was largely independent of site factors such as latitude and altitude, site class, stand factors such as b.a., and tree factors such as age, height or crown ratio. On the other hand, when 60 Pine plus-trees and 441 of their grafted progeny in two clone collections, and 15 Spruce and 43 of their grafted progeny in another clone collection, were analysed, a significant correlation between r.b.d. of parent tree and progeny was found, and it is concluded that this value could be used to select trees with a hereditary capacity for producing heavy wood. Trees with high r.b.d. did not differ from the rest of the population in other wood properties (tracheid length, lignin content, etc.) except latewood content.

4107. DADSWELL, H. E., *et al.* **Tree-to-tree variations and the gross heritability of wood characteristics of *Pinus radiata*.** *Tappi* 44 (3), 1961 (174–9). 23 refs. P.R.

A preliminary account of studies being made on variations in wood characteristics of *P. radiata*, embracing the following topics: the gross heritability (g.h.) of % late wood (l.w.), basic density (b.d.), tracheid length (t.l.), longitudinal shrinkage, spiral grain, % cellulose, and ring width. The estimates of g.h. and of the correlations were made on samples from a clonal plantation. In addition, estimates are given of the g.h. of 4 of the characteristics by a method using both clonal and seedling trees. In the material concerned, g.h. of % l.w., b.d., and t.l. was found to be relatively high, that of % cellulose low. The investigations are to continue with material from clonal plantations and seedling progeny tests.

4108. NICHOLLS, J. W. P., and DADSWELL, H. E. **Project W.S. 18–2, Progress Report No. 3. Assessment of wood qualities for tree breeding in *Pinus radiata* D. Don from Victoria.** Division of Forest Products, C.S.I.R.O., S. Melbourne. 1961. pp. 12 + 3 gphs. 7 refs. Limited distribution.

Reports on significant correlations, similar to those reported earlier, between the features then examined and measured [see *F.A.* 22 Nos. 1151–2]. Applying the conclusions arrived at in the earlier work, the wood quality of the 28 trees was assessed on the basis of cell length and basic density. Twenty-three trees provided results for calculating the means used in assessing all the trees, and it is suggested that those with below-average wood quality and excessive angles of spiral grain be rejected. The results obtained are compared with those reported earlier for trees grown in Tasmania and the Australian Capital Territory. *From authors' summary.*

4109. NICHOLLS, J. W. P., and DADSWELL, H. E. **Project W.S. 18–2. Progress Report No. 4. Assessment of wood qualities for tree breeding in *Pinus radiata* D. Don from South Australia.** Division of Forest Products, C.S.I.R.O., S. Melbourne. 1961. pp. 11 + 3 gphs, 4 tbls. 5 refs. Limited distribution.

Specimens from 45 trees of *P. radiata*, selected as plus trees for breeding purposes, were examined. Significant correlations were found between certain features mentioned in earlier reports [see preceding abstract], and comparison of the results for the first 24 trees examined with those for the remainder indicated that the 24 trees were representative of the whole population under review, and therefore provided results suitable for calculating the means used in assessing all the trees. Applying the conclusions previously reached, the wood quality of the 45 trees was assessed on the basis of cell length (c.l.) and basic density (b.d.), and two separate criteria of assessment are proposed, viz. higher-than-average c.l. and lower-than-average b.d. The results are compared with those presented in the 3 earlier reports.

4110. ZOBEL, B., THORBJORNSEN, E., and HENSON, F. **Geographic, site and individual tree variation in wood properties of Loblolly Pine.** *Silvae Genet.* 9 (6), 1960 (149–58). 65 refs. [E.e.g.f.]

A study was made to determine the extent of variation in wood grown in 7 south-eastern states with regard to (1) sp. gr., (2) tracheid length at (*a*) 15 years, and (*b*) 30 years, (3) % of water-insoluble carbohydrates, (4) % of α-cellulose, and (5) % of compression wood, all these characters being phenotypic in nature. Similar investigations on softwoods are reviewed. Highly significant differences were found between sites for all the characters studied. In particular (1) and, to a lesser extent, (2) followed a geographical pattern. For (1) there were three distinct geographical groups; low values occurred in the northern and north-western limits of the species range, intermediate values in the Piedmont, and the highest values in the coastal plain of the Carolinas and Georgia. Cellulose yields based on dry weight of wood did not appear to follow any geographical pattern. Variation among trees within each plot was highly significant for (1) and (2), but not for (4) and (5). Ranges of individual values among trees within individual plots were extremely wide. (2*a*) and (2*b*) were closely related, as were also (3) and (4). A high negative correlation was found between (5) and cellulose yields. Several other characteristics were significantly correlated, but the correlation coefficients were rather small, e.g. between (1) and (2) (negative), and between (2) and (4). Both these correlations are probably affected in part by (5), which showed a relationship to both (2) and cellulose yields.

4111. THORBJORNSEN, E. **Variation in density and fiber length in wood of Yellow Poplar [*Liriodendron tulipifera*].** *Tappi* 44 (3), 1961 (192–5). 6 refs. P.R.

To determine whether differences in wood properties among Yellow Poplars were sufficiently marked to encourage a breeding programme based on individual tree selection, data were obtained from 10 stands and 63 individual trees. Density increased from inner core to outer wood: at 5 years the average was 0·42 g./c.c.; at 15 years, 0·45; and at 25 years, 0·46. Results from alcohol/benzene extraction indicated that the main difference between sapwood (s.w.) and heartwood (h.w.) was due to the stains present in the h.w. On an average 2·5% of the dry matter was removed in the extraction process, with no variation of this amount in the radial direction. The component of total variation in density which the individuals account for is large, viz. ca. 70%. During the first few years of growth there is a marked increase in fibre length, which tends to level off in later years. Differences among trees with short and long fibres are large, but the analysis of variance indicates that they are not significant, because of a large within-tree variance component which can be reduced by measuring a larger number of fibres and taking greater care in sampling the same portion of a given annual ring. *From author's summary.*

4112. KRAHL-URBAN, J. Einige Ergebnisse von Drehwuchs-Untersuchungen bei Rotbuchen. **[Some results of investigations into spiral grain in Beech.]** *Abstr.* in *Silvae Genet.* 9 (5), 1960 (139). [G.]

Investigations in various German Beech stands led to the following conclusions: (1) the % of trees with spiral grain varies and does not depend upon factors associated with the stand; (2) left-hand spiral is more common than right; (3) the defect is not confined to the stem, but occurs also in branches and twigs; (4) there is evidence that in Beech spiral grain is a dominant genetic character; (5) the loss in value of the timber is considerable—in Bramwald it amounts to 7%.

4113. MĂŞCAN, A. Cerul (*Quercus cerris* L.) şi varietăţile sale identificate în pădurile din vestul ţării. **[Varieties of *Q. cerris* identified in the forests of the west of Rumania.]** *Rev. Pădurilor* 75 (11), 1960 (654–9). 6 refs. [Rum.russ.g.f.e.]

Two types of *Q. cerris* are commonly distinguished in Rumania—'red' and 'white' from the colour of the heartwood. Whereas white yields excellent wood, comparable to that of *Q. robur*, the red is very much inferior, with a great tendency to heart cracks. A study of the sites on which the two types are found showed that the red occurs on podzols with a compacted impermeable B horizon, on plateaux or the upper parts of slopes. These sites are characterized by *Calamagrostis epigeios*, *Carex pilosa*, *Genista tinctoria*, *Brachypodium sylvaticum* and *Festuca sulcata*. Visible external differences in form and bark of the two types are described.

4114. BOBROV, E. G. Introgressivnaja gibridizacija vo flore Bajkal'skogo Sibiri. **[Introgressive hybridization in the flora of the Baikal area of Siberia.]** *Bot. Ž.* 46 (3), 1961 (313–27). 33 refs. [Russ.e.]

Discusses introgressive hybridization in seven genera, including *Betula* [cf. *F.A.* 22 No. 186] and *Larix* [cf. *F.A.* 22 No. 2841], in the Baikal area. The urgent necessity of revising plant nomenclature in this area is pointed out.

4115. EIFLER, I. Untersuchungen zur individuellen Bedingtheit des Kreuzungserfolges zwischen *Betula pendula* und *Betula pubescens*. **[The individual results of crosses between *B. verrucosa* and *B. pubescens*.]** *Silvae Genet.* 9 (6), 1960 (159–65). 20 refs. [G.g.e.f.]

All possible interspecific crosses were carried out between 6 trees of *B. verrucosa* and 6 of *B. pubescens*. All the crosses *B. verrucosa* ♀ × *B. pubescens* ♂ were generally more successful than the reciprocal crosses. The combining ability of each of the selected trees differed greatly. Two *B. pendula* and two *B. pubescens* were highly compatible, some partners were incompatible, others were intermediate. Some combinations produced exclusively or predominantly triploid progenies, whereas others produced individuals with 28 chromosomes. The triploids were most resistant to Birch rust, whereas the progenies with 28 chromosomes were severely damaged. *From author's summary.*

4116. SAUER, E. Altstammsorten der Schwarzpappelbastarde (IIu.). Verfahren und Möglichkeiten der Sortenprüfung. **[Old stock varieties of Black Poplar hybrids (IIu.). Methods and possibilities of variety testing.]** *Holz-Zbl.* 86 (150), 1960 (2129–32). 13 refs. [G.]

[Cf. *F.A.* 22 No. 4152.] In studies at Brühl all provenances tested could be sorted into ca. 60 homogeneous groups (clones) which included the 16 old-stock varieties of central Europe, differing from each other in several of the characters investigated [cf. *F.A.* 19 No. 3856; 20 No. 197]. The cvs. 'Serotina' and 'Selys' differed only in the degree of negative geotropism of their branches and are thought to have evolved from one clone by mutation. The author discusses the problems of further refinement, the quantitative definition of the characters used, and the need for methods of identification at other ages or in other seasons, for the assessment of practical usefulness, including the problems of environmental influences on characters and properties. In this connexion first results of trials with the 16 old-stock varieties established in 1959 and 1960 on 32 German and 1 Dutch site are mentioned, as also tests in which crosses between Black Poplar hybrids and Black Poplars exceeded in height, as 2 + 1 seedlings, crosses of Black Poplar hybrids.

4117. KONOVALOV, N. A. Ural'skaja piramidal'naja osina. **[The Urals fastigiate Aspen.]**

Lesn. Ž., Arhangel'sk 3 (3), 1960 (156–7). 4 refs. [Russ.]

A brief description of the hybrid, produced by crossing *Populus tremula* ♂ with *P. jablokowii* (i.e. *P. tremula* × *P. bolleana*), with notes on its propagation. It is a decorative, frost-resistant tree, of interest for park and street planting.

4118. Giordano, E. Osservazioni su alcuni ibridi di *Eucalyptus viminalis* × *E. globulus*. **[Some hybrids between *E. viminalis* and *E. globulus*.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (45–52 + 4 plates). 5 refs. [It.it.e.]

Describes and discusses natural hybrids occurring near Rome.

4119. Lamb, F. B. **An approach to Mahogany tree improvement**. *Carib. For.* 21 (1/2), 1960 (12–20). 37 refs. [E.e.]

Notes outlining the problem and inviting Caribbean co-operation in developing a programme. The distribution, and indications on variation in morphology, anatomy and technical properties, of the following are given:—*Swietenia macrophylla* (and forms *candollei*, *tessmannii*, *belizensis*, and *krukovii*); *S. humilis* (and form *cirrhata*); *S. mahagoni*. Introductions into West Indian islands are reported on. The improvement plan should cover a survey of natural variation, segregation of superior races, inter- and intraspecific breeding, and further selection.

4120. Pate, J. B., Joyner, J. F., and Seale, C. C. **Vigor in an interspecific hybrid of *Sansevieria*.** *Econ. Bot.* 14 (3), 1960 (175–9). 9 refs.

Tabulates propagation and biometric data, yields per acre of green leaf, dry fibre etc., and mean tensile strength, shear, wear and flex of fibres of *S. trifasciata* and *S. deserti* and F_1 hybrids of these, grown on peat and sand soils in Florida. The hybrids were superior in total green yield, % of fibre leaves (longer than 20 in.) and fibre yields. Further selection is likely to produce valuable new types.

4121. Czeika, G., and Schiman, H. Die Chromosomen von *Ginkgo biloba*. **[The chromosomes of *G. biloba*.]** *Österreichische Botanische Zeitschrift, Wien* 107 (1), 1960 (1–5). 6 refs. [G.g.] O.R.S.

4122. Rao, H. S. **Chromosome counts of some plants**. *Indian For.* 87 (1), 1961 (34–6). 2 refs.

Gives results of counts for 52 species, nearly half of which are exotics introduced at Dehra Dun. For the genera *Callicarpa* ($n = 17$), *Cardiospermum* ($n = 10$), *Cordia* ($n = 18$ or 24), *Dombeya* ($n = 32$) and *Mimosa* ($n = 12$) the chromosome numbers of the species studied do not agree with those already reported for these genera.

4123. Ruggeri, C. Primo contributo alla conoscenza cariologica del genere *Eucalyptus* (Myrtaceae). **[The karyological study of the genus *Eucalyptus*. Part I.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (121–5 + 2 plates). 9 refs. [It.it.e.]

A study was made of *E. melanophloia*, *E. leucoxylon*, *E. astringens*, *E. maidenii*, *E. elaeophora*, *E. cinerea*, *E. bicostata*, *E. ovata*, *E. dalrympleana*, *E. gomphocephala*, *E. cornuta*, *E. fastigata* and *E. bridgesiana*. Each species was diploid with $2n = 22$, and showed extremely small chromosomes, only slightly staining.

4124. Ruggeri, C. Secondo contributo alla conoscenza cariologica del genere *Eucalyptus* (Myrtaceae). **[The karyological study of the genus *Eucalyptus*. Part II.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (139–50 + 3 plates). 5 refs. [It.it.e.]

The chromosome number has been determined for *E. brockwayi*, *E. aggregata*, *E. corynocalyx*, *E. goniocalyx*, *E. macarthurii*, *E. lehmannii*, *E. tereticornis*, *E. albens*, *E. polyanthemos*, and *E. occidentalis*. With the exception of *E. corynocalyx* ($2n = 24$), all the species examined showed a constant diploid number of $2n = 22$.

4125. Ruggeri, C. Il numero cromosomico di *Eucalyptus flocktoniae* Maiden (Myrtaceae). **[Chromosome number in *E. flocktoniae* Maiden.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (211–23 + 1 plate). 15 refs. [It.it.e.]

A study was made of the chromosome number $2n = 24$. The chromosomes stain well and are readily distinguished. *E. flocktoniae*, *E. redunca* and *E. corynocalyx*, the only species of Eucalypt so far known to have a diploid set of 24 chromosomes, all originate in southern Western Australia, are morphologically very similar, and grow in a region of summer drought and moderate or low winter rainfall.

4126. Ruggeri, C. Il numero cromosomico di *Eucalyptus* × *trabutii* Vilmorin (Myrtaceae). **[Chromosome number in *E.* × *trabutii*.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (39–43 + 1 plate). 6 refs. [It.it.e.] [Cf. *F.A.* 22 No. 1448.]

168. Histology

See also Nos. 4556, 4986 *et seq.*, 5041.

4127. Straus, J., and Epp, R. R. **Response of *Cupressus funebris* tissue cultures to gibberellins.** *Science* 131 (3416), 1960 (1806–7). 12 refs. O.R.S.

Tissue cultures of staminate cones were originally maintained on a medium containing coconut milk; a mixture of acid-hydrolysed casein hydrolysate and gibberellins replaced the coconut milk entirely and gave even better growth. It is suggested that the milk contains gibberellins or related substances and that these are involved in the N metabolism of the tissue.

4128. Chardenon, J., and Taris, B. Remarques sur la structure des tissus néoformés et l'apparition d'organes spécialisés chez quatre cultivars de *Populus* et chez *Salix alba*, cultivés *in vitro*. **[The structure of newly-formed tissue and the appearance of specialized organs in four cultivars of *Populus* and in *S. alba*, grown *in vitro*.]** *C.R. Acad. Sci., Paris* 251 (19), 1960 (2070–1). [F.] O.R.S.

The new tissue consisted of undifferentiated parenchyma with a few patches of cells whose walls contained a lignified network. Roots, shoots and leaves developed only in primary explants.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See Nos. 4704 *et seq.*, 5156 *et seq.*, 5234.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also Nos. 4037, 4162.

4129. NOVIKOV, A. L. Opredelitel′ derev′ev i kustarnikov v bezlistnom sostojanii. **[Key to trees and shrubs when leafless.]** Sel′hozgiz, Ukrainian SSR, Kiev. 1959. pp. 315. 30 refs. [Russ.] From *review* in *Bot. Ž.* 45 (6), 1960 (925–8). [Russ.]

Lists, for >700 spp. in 130 genera, the bud and shoot characteristics, bud and shoot distribution in both natural conditions and plantations, the biology of the plant, and its growth form, dimensions, and uses. There are indexes to Russian and Latin names.

4130. VASIL′ČENKO, I. T. Vshody derev′ev i kustarnikov. (Opredelitel′.) **[Seedlings of trees and shrubs. (A key).]** Izdatel′stvo Akademii Nauk SSSR, Moscow & Leningrad. (2nd ed.) 1960. pp. 302 + 4 figs. [Russ.] From *review* in *Bot. Ž.* 46 (1), 1961 (141–5). 6 refs. [Russ.]

The book contains keys for determining seedlings of ca. 700 species and 270 genera of trees and shrubs (73 families) native to, or introduced into, the U.S.S.R. Drawings are given of the aerial parts and root systems of many of the plants.

4131. EXELL, A. W., and WILD, H. [Editors]. **Flora Zambesiaca. Mozambique, Federation of Rhodesia and Nyasaland, Bechuanaland Protectorate. Volume One: Part One, 1960, Part Two, 1961.** Crown Agents for Overseas Governments and Administrations, London. pp. 581 + vi + 2 plates + 2 maps. Many refs.

Volume I of this work, sponsored by the Governments of the Federation of Rhodesia and Nyasaland, Portugal and the United Kingdom, covers the gymnosperms, and the angiosperms from Ranunculaceae to Sterculiaceae. There is an illustrated glossary of botanical terms (reprinted from the Flora of West Tropical Africa with additions, modifications and Portuguese equivalents) and a key to families and higher groups.

4132. MACBRIDE, J. F. **Flora of Peru.** *Botanical Series, Field Museum of Natural History, Chicago* 13 (Part 5, No. 2), 1960 (539–854 + i).

Boraginaceae, Verbenaceae (including *Avicennia*), Labiatae, Nolanaceae. [Cf. *F.A.* 21 No. 4097; 22 No. 1468.]

174.2/7. Gymnosperms

See also Nos. 4075, 4098, 4987–8.

4133. HAYASHI, Y. **Taxonomical and phytogeographical study of Japanese conifers.** [Publisher not given] 1960. pp. 460. [Jap.*e.*] From *review* in *Forstarchiv* 32 (2), 1961 (39–40). [G.]

A fully illustrated monograph, in Japanese but with Latin plant names and English legends, including: distribution maps for 78 species and forms; photographs of these and their typical features; diagrams of altitude distribution; tables of plants found in association with the major species. [Cf. *F.A.* 16 No. 2732.]

4134. [GAJIĆ, M.] O jednoj novoj formi jele (*Abies alba* Mill). Prethodno saopštenje. **[A new form of *Abies alba*. Preliminary communication.]** *Šumarstvo* 13 (11/12), 1960 (513–4). 5 refs. [Serb. f.*f.*]

A new form of *A. alba* found in the Maljen and Goč Mountains, Serbia, has been named var. *fusco-violacea*. Its seed-scales have two marked projections at their base, and the seeds, of a dark violet colour, show 20% less germination than the yellowish seeds of the typical form.

4135. KERFOOT, O. ***Juniperus procera* Endl. (the African Pencil Cedar) in Africa and Arabia. 1. Taxonomic affinities and geographical distribution.** *E. Afr. agric. For. J.* 26 (3), 1961 (170–7). 43 refs.

Includes a distribution map of *J. procera*, *J. phoenicia* and *J. macropoda*, in Africa east of long. 25° E. and in the Arabian Peninsula. The occurrence of the first in the mountains from Mecca to the Yemen and in the Haut Katanga, Congo is noted.

4136. PIERRE, Y. DE. Une nouvelle espèce de pin au Viet-Nam, *Pinus dalatensis*. **[*P. dalatensis*, a new species of Pine from Viet-Nam.]** *Trav. Lab. For. Toulouse* 1 (6), Art. 4, 1960. pp. 10. 14 refs. [F.]

Describes a new 5-leaved Pine, *P. dalatensis*, collected by H. Gaussen in S. Viet-Nam.

4137. FUKAREK, P. Planinski bor-klekovina (*Pinus mugo* Turra) i njegovo značenje za zaštitu tla i vegetacije naših planina. **[*Pinus mugo* and its importance in the protection of the soil and vegetation of our mountains.]** *Repr.* from *Naše Starine, Sarajevo* No. 6, 1959 (203–18). 23 refs. [Croat.g.]

Discusses the taxonomic position of *P. mugo* in Bosnia and Herzegovina, with a map and description of its distribution. Its importance in preventing erosion, etc., on mountain sites and the need for protecting it are stressed.

4138. FERRÉ, Y. DE, and ROUANE, P. Formes horticoles de *Thuya* et *Chamaecyparis*. **[Horticultural forms of *Thuya* and *Chamaecyparis*.]** *Trav. Lab. For. Toulouse* 1 (6) Art. 5, 1960. pp. 16. 22 refs. [F.]

Attempts to classify cultivars of both genera according to (1) leaf type, (2) phyllotaxy or ramification, (3) height, (4) habit, and (5) colour.

175.2. Monocotyledons

4139. STONE, B. C. **The genus *Sararanga* (Pandanaceae).** *Brittonia, N.Y.* 13 (2), 1961 (212–24). 4 refs.

A review, with key, of the taxonomy and distribution (British Solomon Is. and Philippines) of the two known species—*S. sinuosa* and *S. philippinensis*.

176.1. Dicotyledons

See also Nos. 4043, 4076–7, 4083–7, 4090, 4114–8, 4699, 4703, 4990.

4140. CODD, L. E. **Notes and new records of African plants: Apocynaceae.** *Bothalia* 7 (3), 1961 (447–55). Many refs.

Includes some new combinations and changes of rank in the genera *Acokanthera*, *Carissa* and *Adenium*, and a description of *Strophanthus luteolus* sp. nov., a shrub from the Transvaal and Natal.

4141. WINTER, B. DE, and WHITE, F. **Notes and new records of African plants: Ebenaceae.** *Bothalia* 7 (3), 1961 (457–8). Many refs.

Lists new names and combinations under *Diospyros*, made necessary by the merging of *Royena* in that genus.

4142. KOCHUMMEN, K. M. **Manual of Malayan timber trees. Dilleniaceae.** *Res. Pamphl. For. Res. Inst., Kepong* No. 32, 1960. pp. 5 + 2 sets of drawings.

[Cf. *F.A.* 16 No. 3846.] Gives a field key, and describes in detail 5 species of *Dillenia—D. eximia*, *D. obovata*, *D. ovata*, *D. pulchella*, and *D. reticulata*.

4143. MCVAUGH, R. **Euphorbiaceae novae Novo-Galicianae.** *Brittonia, N.Y.* 13 (2), 1961 (145–204). Many refs.

Taxonomic notes and distribution records, including descriptions of new woody species in the genera *Acalypha* (2 spp. nov.), *Bernardia* (3), *Croton* (3), *Manihot* (2), *Phyllanthus* (3), and *Sebastiania* (1—*S. jaliscensis*), all from the Jalisco region, Mexico.

4144. VASSAL, J. Sur la valeur spécifique du *Quercus occidentalis* Gay. **[The specific status of *Q. occidentalis*.]** *Trav. Lab. For. Toulouse* 1 (6) Art. 3, 1959. pp. 11. 19 refs. [F.]

Concludes that Gay's creation (1857) of a separate species *Q. occidentalis* for *Q. suber* in the western part of its range (Portugal, Landes) is not justified by the anatomical, morphological or ecological evidence.

4145. GILLETT, J. B. **Notes on *Millettia* Wight & Arn. in East Africa.** *Kew Bull.* 15 (1), 1961 (19–40). 4 refs.

Includes descriptions of *M. puguënsis*, *M. lacus-alberti*, *M. mossambicensis*, *M. semseii*, and *M. elongatistyla* spp. nov. Some new subspecific combinations are made.

4146. FLOYD, A. G., and HAYES, H. C. **N.S.W. rain forest trees. Part 1. Family Lauraceae.** *Res. Note Div. For. Mgmt. For. Comm. N.S.W.* No. 3, 1960. pp. 40 + 1 map, 1 set of drawings.

Complete descriptions of 27 species, with keys based on (1) leaves and branchlets, (2) stem and bark.

4147. SMITH, C. E., JR. **A revision of *Cedrela* (Meliaceae).** *Fieldiana (Bot.)* 29 (5), 1960 (295–341 + 8 plates). 33 refs.

[Cf. *F.A.* 22 No. 1486.] *Cedrela*, exclusively tropical American, is distinguished from the Old-World genus *Toona*. The paper includes a key to the species, notes on their economic importance, distribution, etc., and descriptions of *C. odorata*, *C. angustifolia*, *C. lilloi*, *C. oaxacensis*, *C. fissilis*, *C. montana* and *C. weberbaueri*.

4148. CORNER, E. J. H. **Taxonomic notes on *Ficus* Linn., Asia and Australasia. V. Subgen. *Ficus* sect. *Rhizocladus*, *Kalosyce*, *Sinosycidium*, *Adenosperma*, and *Neomorphe*.** *Gdns' Bull.* 18 (1), 1960 (1–69). [Cf. *F.A.* 22 No. 196.]

4149. GARDNER, C. A. **Trees of Western Australia. No. 83—the Many-flowered Mallee; No. 84—the Yate; No. 85—the Grey Gum; No. 86—*Eucalyptus albida*.** *Bull. Dep. Agric. W. Aust.* No. 2846, 1961. pp. 8.

Brief notes on *E. cooperiana*, *E. cornuta*, *E. griffithsii* and *E. albida*.

4150. ABDURAHMANOV, A. A. K sistematike roda *Fraxinus* L. **[The systematy of *Fraxinus*.]** *Doklady Akademii Nauk Uzbekskoj SSR* No. 7, 1959. [Russ.] From *review* in *Bot. Ž.* 45 (7), 1960 (1079–80). [Russ.]

Seeks to show that *F. potamophila* is a species in its own right, and not a synonym of *F. sogdiana*.

4151. DING HEU. **A review of the genus *Rhizophora* with special reference to the Pacific species.** *Blumea* 10 (2), 1960 (625–34). 16 refs. [E.] O.R.S.

Discusses distribution, presents a key, and describes *R. mucronata*, *R. stylosa*, *R. lamarckii*, *R. apiculata*, *R. mangle* and *R. harrisonii*. *R. racemosa* occurs on the Atlantic shores of W. Africa and the Americas.

4152. MÜLLER, R. Altstammsorten der Schwarzpappelbastarde (IIv). Neusorten aus Altstämmen und fremde Altsorten. **['Old stock' varieties of Black Poplar hybrids (IIv). New varieties from 'old stocks', and foreign 'old stock' varieties.]** *Holz-Zbl.* 87 (21), 1961 (319–24). 21 refs. [G.]

[Cf. *F.A.* 22 No. 4116.] A brief description of 30 further varieties, presumed or claimed to be hybrids descended from 'old stock' varieties but including also *P. nigra* var. *italica* and *P.* 'Charkowiensis' (*P. nigra* × *P. n.* var. *italica*). Photographs show the typical leaf-shape of 22 of these varieties. Special attention is given to the phenology of leaf-fall and rust susceptibility. Tables and diagrams, for comparison of these characteristics in the varieties discussed in this and previous papers are presented, based on observations in Brühl in the autumn of 1960. Most of the varieties described in the present paper are considered inferior to the 16 common 'old stock' varieties. Only 'Lingenfeld', and for special purposes, 'Nigra Irresheim', and to a certain extent, 'Baden 8/9/10', 'Baden 513', 'Baden 553', 'Eugenei', 'Haro' and 'Steckby' are considered worth cultivating. 'Serotina du Poitou' is considered worth trying in the N.W. German coastal region, and 'Zurich 03/3 Yvonand' on the warmest S.W. German sites.

4153. ROYEN, P. VAN. **Revision of the Sapotaceae of the Malaysian area in a wider sense.**

XXIII. ***Palaquium* Blanco.** *Blumea* 10 (2), 1960 (432–606). Many refs. [E.] O.R.S.

Discusses the distribution, presents keys, and describes 109 species and 6 doubtful species. *P. elegans*, *P. kinabaluense*, *P. komakomor*, *P. vexillatum*, *P. cryptocariifolium*, *P. simun*, *P. morobense*, *P. maliliense*, *P. cochleariifolium*, *P. vitilevuense*, *P. rufolanigerum*, and *P. brassii* are new species described.

4154. HU, S.-Y. **The economic botany of the Paulownias.** *Econ. Bot.* 15 (1), 1961 (11–27). 10 refs.

A shortened version of a paper already noticed [see *F.A.* 21 No. 4116]. The chief drawings, maps and the key are included.

18. Plant Ecology

See also No. 5305.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 4142, 4154, 4262, 4272–3.

4155. ARENA, M. Alcune notizie sul comportamento biologico di *Abies nebrodensis* (Lojac.) Mattei. **[The biological behaviour of *A. nebrodensis*.]** *Nuovo G. bot. ital.* (*n.s.*) 66 (3), 1959 (451–6). 2 refs. [It.it.e.] A.P.B. [Cf. *F.A.* 22 Nos. 1501, 4221.]

4156. SIMONNEAU, P., and DEBAZAC, E.-F. Les cyprès des Ajjers. **[The Ajjers Cypress.]** *Rev. for. franç.* 13 (2), 1961 (90–7). 14 refs. [F.]

Discusses the botanical and silvicultural characters of *Cupressus dupreziana*, a relict from the post-glacial period, and the only surviving conifer in the Sahara. [Cf. *F.A.* 22 No. 4427.]

4157. MANGIERI, H. R. Cultivo de los "lapachos". **[The cultivation of *Tabebuia* spp.]** *Notas silvíc. Adm. Nac. Bosques, B. Aires* No. 4, 1960. pp. 3. 4 refs. [Span.]

The name Lapacho covers *Tabebuia avellanedae*, *T. ipe*, *T. pulcherrima*, *T. alba* and *T. lapacho*. Short notes are presented on their silvicultural characters, and methods of raising them from seed in Argentina. Being susceptible to frost, they should not be planted out when <1·6–2 m. high. Planting should be done in spring at 2·5 × 2·5 or 3 × 3 m. In El Chaco, *Tipuana tipu* has been used with success as a nurse.

181.1. Distribution, Natural Range

See also Nos. 4133, 4135, 4172.

4158. IONESCU-DUNĂREANU, I. Do pitannja pro pošyrennja sosny kedrovoji jevropejs′koj (*Pinus cembra* L.) v gorah Fagarašu. **[The distribution of *P. cembra* in the Făgăraş Mountains [Rumania].]** *Ukr. Bot. Ž.* 17 (5), 1960 (50–3). 11 refs. [Ukr. russ.e.] A.P.B.

The distribution of *P. cembra* in the Southern Carpathians of Rumania is discussed and related to the occurrence of geomorphological forms resulting from Quaternary glaciation.

4159. BAY, E. Sul pino silvestre in provincia di Bolzano. **[The distribution of *Pinus sylvestris* in the province of Bolzano.]** *Monti e Boschi* 12 (1), 1961 (27–30). [It.f.e.]

Its distribution is described, with some indication of the soils on which it occurs. The principal enemy of Pine in this area is *Thaumetopoea processionea*, which appears to be unable to survive at altitudes above 800 m., and it is recommended that Pine should be planted only above that level.

4160. ZÁCHEJ, Š. Prirodzené rozšírenie osiky (*Populus tremula* L.) na Slovensku. **[Natural distribution of *P. tremula* in Slovakia.]** *Ved. Práce Výskum. Úst. Lesn. Hosp. Bansk. Štiav.* No. 1, 1960 (179–95). 11 refs. [Slovak.slovak.russ.g.]

Tabulates information on the distribution of Aspen [cf. *F.A.* 20 No. 1531], in connexion with the search for good forms for breeding. Most localities with good forms of Aspen lie in the Banská Bystrica area, at 300–700 m. alt., on younger sediments, N. aspects, medium-deep and medium-moist soils, the Aspen being scattered individually, on shady sites, in coniferous and broadleaved stands ≤60 years old.

4161. FRITTS, H. C., and KIRKLAND, B. J. **The distribution of River Birch [*Betula nigra*] in Cumberland County, Illinois.** *Transactions of the Illinois State Academy of Science, Springfield* 53 (1/2), 1960 (68–70). 6 refs. C.G.B.

The species, common beside streams on acid alluvia, was generally absent where these were alkaline, a fact in accordance with its general distribution in the Midwest. Regeneration was found on two sites only, and it is thought that recent farming practice (high rates of lime and fertilizers) may have raised the pH of the alluvia to prohibitive levels.

4162. RAO, R. S., WADHWA, B. M., and ANSARI, M. Y. **Comparative studies on the distribution of some useful trees of tropical evergreen forests in the Western and the Eastern parts of India.** *Indian For.* 87 (4), 1961 (220–41 + 6 photos). 42 refs.

Deals with the distribution of some useful timber species of evergreen forests of both Western and Eastern regions of India, together with their economic utility, and the need for introduction of such species from one region to another. An attempt has been made to include 84 species belonging to 33 genera which represent 16 families, some with their characteristic endemic features. A distribution table together with two maps indicating the occurrence of endemic species only in the evergreen forests of different states in Western and Eastern India, and also two sets of photos, each showing important species of the respective evergreen forests, have been added. *From authors' summary.*

181.2. Atmospheric Relations. Acclimatization

See also Nos. 4056–7, 4062–4, 4071, 4073, 4081–2, 4099, 4101, 4212, 4225–6, 4232, 4235, 4279–82, 4332 *et seq.*, 4409, 4631 *et seq.*, 4998.

4163. PODZOROV, N. V. Vlijanie bokovogo zatenenija na rost i razvitie listvennicy sibirskoj.

[The influence of side shade on the growth and development of *Larix sibirica*.] *Lesn. Hoz.* 12 (12), 1959 (46–8). 1 ref. [Russ.]

Because of *L. sibirica*'s relative resistance to factory smoke and fumes, efforts were made to raise it for planting in and near Leningrad. Investigations in the nursery showed that shading from the W. or S.W. improved growth and development, and increased the yields of standard seedlings per unit area of bed. When 2-year stock was planted out, it grew much better when shaded from the W. by Alder and Spruce, than in the open. When planted in corridors cut in poor stands of Aspen, the Larch did much better in corridors running N.–S. than in those running E.–W. [Cf. *F.A.* 21 No. 3092.]

4164. Nishimura, S., and Tanaka, M. **[The selection of the cold-resistant strain in *Acacia mollissima* (Preliminary Report.) The relation between cold-resistance and the time the pod ripens.]** *J. Jap. For. Soc.* 41 (3), 1959 (98–102). 10 refs. [Jap.jap.e.*e.*]

Seedlings of *A.* '*decurrens* var. *mollissima*', 40 days old, from 7 open-pollinated parents known to ripen their fruit at different times were: (*a*) put in 0·1 and 0·01% $KClO_3$ for 24 hr., then in tapwater for 24–48 hr., in the dark, at ordinary room temperature; (*b*) subjected to −2 and −3° C. for 24 hr. then to ordinary room temperatures for 24 and 48 hr. under ordinary day and night conditions; (*c*) plasmolysed by $CO(NH_2)_2$, KNO_3, $CaCl_2$, or an 8/2 mixture by volume of KCl and $CaCl_2$, and then examined. Direct correlations were found between degree of injury at low temperatures and (1) degree of injury from $KClO_3$, (2) degree of plasmolysis in $CaCl_2$ solution. The later-ripening strains were more cold-resistant.

4165. Nishimura, S. **[Studies on the breeding of *Acacia mollissima* (I). On the selection of cold-resistance tree in the planted land.]** *J. Jap. For. Soc.* 41 (9), 1959 (336–40). 9 refs. [Jap.jap.e.*e.*]

In 1951 an experimental plot was established at 400 m. alt. in Japan in order to study the cold resistance of *A.* "*decurrens* var. *mollissima*", observations being made through 1952–54. It was found that cold-resistant trees included many in which legume ripening or flowering were late. The relationships between the lower temperatures in the forest and the degree of injury were unclear, but it was ascertained that, while some trees suffered no damage at −3° C. for 2 hr., despite a sudden drop in temperature, others, following exposure to −4° for 4 hr., showed signs of damage which were accentuated after subsequent exposure to the same conditions. However, trees exposed to −6° for 2–3 hr. showed no increase in injury after exposure to the same conditions twice within 3 days.

4166. Gentilli, J. Il fattore termico nell' ecologia degli eucalitti. **[The thermal element in the ecology of Eucalypts.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (53–119). 70 refs. [It.it.e.]

In the light of all the available evidence from world literature, the author lists 64 species in order of their resistance to low temperatures as adults. This resistance can be estimated for any species from the simple formula $y = -11{\cdot}38 + 1{\cdot}056x$ where y is the limiting temperature in °C., and x the July mean minimum day temperature in the Australian region of origin. For cold resistance of seedlings, the most reliable indicators are the mean minimum July temperature, the mean July temperature, and the absolute minimum temperature for the locality of origin of the species. A comparison of Australian and Italian climatic data shows that the daily range of temperature is greater in Australia, whereas the rate of autumn cooling is generally much more pronounced in Italy. In an appendix are listed 166 species of Eucalypt with typical Australian localities, July mean minimum temperature, absolute minimum temperature, rate of autumn cooling, and mean annual rainfall.

181.3. Water, Soil and Root Relations

See also Nos. 4113, 4271–3, 4279–82, 4731, 4738–9, 4919.

181.31. Water Relations

See also Nos. 3986–7, 4019–21, 4056, 4060, 4081–2, 4224.

4167. **Plant-water relationships in arid and semi-arid conditions. Reviews of research.** *Arid Zone Research, UNESCO, Paris* No. 15, 1960. pp. 225. Many refs.

The income and loss of water in arid and semi-arid zones (*F. L. Milthorpe*); Soil water relations in arid and semi-arid conditions (*W. R. Gardner*); Physiological and morphological changes in plants due to water deficiency (*O. Stocker*); Adaptation to drought: xerophytism (*H. R. Oppenheimer*); Methods of research on water relations (*F. E. Eckardt*); The management of native vegetation in arid and semi-arid regions (*R. M. Moore*); Principles of dry land crop management in arid and semi-arid zones (*S. A. Taylor*); Significance of fallow as a management technique in continental and winter rainfall climates (*W. J. Staple*); Principles of irrigated cropping (*R. M. Hagan* and *Y. Vaadia*).

4168. Četin, Ja. I. O zasuhostojčivosti eli, listvennicy i sosny v kul′turah lesostepnoj zony Omskoj oblasti. **[The drought resistance of *Picea abies*, *P. obovata*, *Larix sibirica* and *Pinus sylvestris* in plantations in the forest-steppe zone of the Omsk region.]** *Lesn. Hoz.* 12 (12), 1959 (44–6). [Russ.]

Investigations were made on the drought resistance of the four conifers in pure and mixed plantations (mainly ⩾30 years old) in relation to soil type, after the 1951 and 1955 droughts which caused severe mortality, especially of Pine. It is concluded that the Larch and both Spruces are sufficiently drought-resistant on clayey and light soils (with a water table ≯5 m. deep). The Spruces grow well in pure stands, and in (strip) mixture with Birch or Larch and Pine, and can be recommended for plantations, the rehabilitation of Birch stands, amenity, and erosion control.

4169. Tazaki, T. **On the growth of Pine yearlings in coastal dune regions with special reference to their**

drought resistance. *Jap. J. Bot.* 17 (2), 1960 (239–77). 33 refs. [E.e.] C.G.B.

A study was made of the growth of *Pinus thunbergii* seedlings in their first year in coastal dunes, both by laboratory experiments and by field observations. A large part of the field work was done in the *Pinus/Imperata/Lespedeza* communities of Shônan dune, Chigasaki region. Neither the Cl nor the N content of the soils was a limiting factor in growth, but water supply was very important. Drying of the surface soil was serious only in summer; in spring only ca. 2 cm. dried out, vs. a maximum of 20 cm. in summer. Except for the top horizons, the soil kept a m.c. near field capacity up to a level of 50 cm. above groundwater level. The top 30 cm. comprised the rooting layer of the Pines and undergrowth, and this layer retained only 18 mm. of water when drought was at its maximum. In spring, germination was hampered by drying of the upper soil horizon, and only seeds buried at ca. 2–3·5 cm. could succeed in germinating; at lower levels the nutrient relations were unfavourable. When soil water content was kept constant, seeds could germinate at a m.c. >3·2% on an oven-dry basis; the germinated seed could also withstand several days' drought. In summer, however, shortage of available water played a decisive rôle in seedling survival; only a few with exceptionally well developed roots could survive. A method was devised, and is described, of determining lethal water deficit in Pine seedlings. *From author's summary.*

4170. TAZAKI, T. **Studies on the dehydration resistance of higher plants. III. Discussions on general analysis focused on the dehydration resistance of Pine [*P. thunbergii*] yearlings.** *Bot. Mag., Tokyo* 73 (865/866), 1960 (269–77). 8 refs. [E.e. jap.] I.M.I.

[Cf. *F.A.* 19 No. 1469.] Investigates mathematically the reactions of cut branches according to the equation

$$t = \frac{1}{C}\left(\frac{6000\,D}{d} - \frac{A}{k}\right)$$

where t is the dehydration resistance in hours, A and C are respectively the stomatal and final (cuticular) transpiration rates in mg./g. dry wt./hr./10 mm. Hg, and k is the rate of transpiration decrease, D the lethal deficit in % of oven-dry wt., and d the atmospheric moisture deficit in mm. Hg. In cases of high resistance the term A/k can be neglected (as in what follows). Values for t in *Pinus thunbergii*, calculated from hourly readings through a morning, were 120 or 160 hours, with values for A varying from 480 to 2385 and C at 15 or 20. A table showing observed values of A and C for 30 species of herbs and deciduous and evergreen trees and shrubs is given. On the basis of cuticular transpiration (C) the following order of drought resistance appears: Pine >*Chamaecyparis* >*Cryptomeria* and generally: Pine seedlings >succulents >evergreen broadleaved >deciduous broadleaved >Gramineae >sappy herbs >water plants.

4171. SMITH, D. M., and WILSIE, M. C. **Some anatomical responses of Loblolly Pine to soil-water deficiencies.** *Tappi* 44 (3), 1961 (179–85). 29 refs. P.R.

Three 17-year Loblolly Pines, from a good site at Crossett, Ark., showed, at the midpoint of each annual height increment (a.i.), a basipetal interaction between the anatomical features studied and June–Oct. soil-water deficits. Years of small water deficits were characterized by low %'s of latewood at the apex and high %'s at the base of the corresponding increments; as water deficits increased, this trend became less pronounced, and, in the year of severe drought, was reversed. The width of the late-wood zone, the radial counts and widths of latewood tracheids, and the sp. gr. of the a.i.'s showed similar trends. The width of the a.i.'s at all heights in the trees, however, was negatively correlated with soil water deficits, so that the greater the deficit, the narrower the ring.

4172. MCMINN, R. G. **Water relations and forest distribution in the Douglas-Fir region on Vancouver Island.** *Publ. Dep. Agric. Can.* No. 1091, 1960. pp. 71. 46 refs.

The climate, vegetation, microclimate, soil profiles, and soil-moisture regimes of 24 plots were analysed to evaluate the influence of water relations on forest distribution. Species representation and the abundance and vigour of plants were found to be correlated with differences in soil-moisture regime and atmospheric humidity. Since rainfall supplies little moisture during the growing season in this rain-shadow region, two influential factors regulating soil-moisture regimes are the moisture-storage capacity of soil profiles and the extent of seepage. The catenary distribution of stands typical of hillsides seems to reflect the sequence of soil-moisture regimes controlled by these factors. It was concluded that ridges are droughty partly because their topographic position precludes groundwater from supplementing moisture stored in their profiles and partly because such reserves are usually limited by shallow soil depth and coarse texture. Further downslope, both seepage from upper slopes and deeper soils normally result in moister soils and a higher site index for Douglas Fir. *From author's summary.*

181.32/34. Soil and Nutrient Relations

See also Nos. 3981, 3988, 3992, 3994, 3996–8, 4007–10, 4271–3, 4460, 4644, 5316.

4173. VIKTOROV, D. P., and BYSTRJANCEV, N. I. Povyšenie zasuhoustojčivosti sejancev berezy i vjaza pod vlijaniem fosfornyh udobrenij. **[Increasing the drought resistance of Birch and Elm seedlings with P fertilizers.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (35–40). 13 refs. [Russ.russ.]

[Cf. *F.A.* 21 No. 2726.] On a grey forest soil in a nursery at Voronezh, plots were given the following fertilizer treatments: (1) none; (2) NK (15 and 20 kg./ha. respectively); (3) NPK (15/10/20); (4) NPK (15/20/20); (5) NPK (15/30/20); and (6) NPK (15/40/20). *Ulmus laevis* and *Betula verrucosa* were then sown, and Arland's method [see *F.A.* 16 No. 84] used to determine transpiration. Leaf moisture deficit was also determined. Data are tabulated on the dry weights and transpiration rates of the seedlings. Treatment (2) had little effect on seedling growth, but NPK treatment caused significant increases in seedling size and weight. Increasing the P nutrition increased the drought resistance of the seedlings by reducing transpiration, and brought about a change in leaf structure, the length of veins per unit area decreasing with increasing doses of P. Taking the transpiration rate of controls (1) as 100%, in Birch the transpiration rate was 99, 83, 75·1, 74·9 and 56·1%, and in Elm 100·7, 86·6, 79·1, 71·9 and 62·4%, for treatments (2), (3), (4), (5) and (6) respectively.

4174. GEEBELEN, M., and SCHEYS, G. Bijdrage tot de kennis van de bodemgeschiktheid voor naaldhout. **[The suitability of soils for the production of softwood.]** *Agricultura, Louvain* 9 (1), 1961 (3–24). [Du.du.f.e.] C.G.B.

The relationship was studied between certain soil factors and the growth of Japanese Larch, Scots and Corsican Pine, and Douglas Fir in the forests of Meerdaal and Héverlé. Measurements were made of girth and height, and a classification of the soil series was drawn up for each species, based on an analysis of variance. In general, conifers growing on dry sandy loam soils make greatest growth. The influence of soil type on growth is most marked with Japanese Larch. Differences in girth increment were more pronounced than differences in height, but height measurements for an evaluation of this kind are more significant because less variable. *From authors' summary.*

4175. ŠUMAKOV, V. S. Vlijanie gorizontov počvy na sostojanie posevov sosny i eli. **[Effect of soil horizons on the condition of Scots Pine and Norway Spruce seedlings.]** *Lesn. Hoz.* 13 (11), 1960 (31–2). [Russ.]

In pot trials, seed germination and growth of seedlings were compared in the A_1 and A_2 horizons of a sod-podzolic, light, clay-loam soil kept at 40, 60 and 80% of maximum water-holding capacity. Data are tabulated on seedling survival, weight and size. Survival and development were significantly better with the A_1 than with the A_2 horizon at all soil m.c.'s. The adverse effect of the A_2 horizon was greater on Spruce than on Pine, and increased with increasing soil m.c.

4176. HOTJANOVIČ, A. V. O haraktere vlijanija zastojnyh počvenno-gruntovyh vod na obmen veščestv sosny. **[The nature of the effect of stagnant groundwater on Scots Pine metabolism.]** *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (34–9). 9 refs. [Russ.russ.]

[Cf. *F.A.* 20 No. 1435; 21 No. 252.] Studies were made in Pine stands (55 years old, site class IV) in the *Pinetum sphagnoso-myrtillosum* near Leningrad, on sites that were regularly flooded (high water table with stagnant water) in spring and autumn. Control plots were on unflooded areas (site class II–III). The following were determined: uptake of nutrients (by analysis of root wood and bark, and of needles for N, P, K and total ash); carbohydrates in roots and needles; root respiration; and amino acids in the roots. Periods of flooding considerably reduced nutrient uptake, both during and for some time after the flooding. The rate of nutrient uptake during flooding was determined by soil aeration and the respiration rate of the roots. Roots in the A_0 horizons were more active in nutrient uptake than those in the B horizons. Carbohydrate contents were increased in roots and needles as a result of poor utilization of sugars owing to reduced respiration. Poor aeration in the rooting zone reduced amino-acid formation, the rate of which depends on the respiration rate.

4177. KRAL, F. Untersuchungen über den Nährstoffhaushalt von auf gleichem Standort erwachsenen Fichtenjungpflanzen in Abhängigkeit von ihrer Wuchsenergie und Herkunft. **[The nutrient regime of young Spruce plants grown on the same site in relation to their growth vigour and provenance.]** *Cbl. ges. Forstw.* 78 (1), 1961 (18–38). 21 refs. [G.g.]

Two-year-old dormant seedlings were analysed in bulk (but the needles, stems, and roots separately) in groups of 100 plants (*a*) >10, (*b*) 8·5–10 and (*c*) <8·5 cm. in height, for each of two provenances. Within each provenance, water content (in % of green weight), total ash content, and contents of N, P and Ca (in % of dry weight) decreased with increasing height, while the K content in aerial parts increased, and alkalinity (an index of excess of bases in the ash) and N/P ratio differed little. Similarly, of 10 provenances from the same alpine valley, five that came from 1500–2000 m. alt. and were much shorter than the other 5 from 700–1200 m. alt. had generally higher ash, N, P and Ca contents. K content and alkalinity differed little, but water content of aerial parts was less. The higher mineral content of smaller plants is attributed to their relatively larger root systems.

4178. **Tree nutrition and soil research.** *Extr.* from *Rep. For. Res. Inst. N.Z. For. Serv. 1958–59*, 1960 (20).

Studies have been made of: (1) nutrient return in litter and rainfall under exotic conifers [see *F.A.* 21 No. 1345]; (2) nutrient content of *Pinus radiata* trees [see *F.A.* 22 No. 1395]; and (3) return of nutrients in thinnings left lying in the forest. In (3) it was found that, after 10 years' growth and 'thinning to waste' in a 10-year stand of naturally regenerated *P. radiata*, 75% of all the N, K, P, and Ca taken up by the trees had been returned to the ground either in litter or in slash. From the data provided by these three studies, it was possible to estimate the nutrient demands made upon the soil at the various stages of the growth of a crop of *P. radiata*. The demand is largest during the first 10 years; thereafter the decomposition of litter and slash provides considerable quantities for re-use by the trees. The withdrawal of K and P from the heartwood for re-use within the tree also lessens the demand on the soil.

4179. SMIRNOVA, K. M., and GORODENCEVA, G. A. Potreblenie i krugovorot ėlementov pitanija v berezovom lesu. **[Consumption and circulation of nutrients in Birch forest.]** *Bjulleten' Moskovskogo*

Obščestva Ispytatelej Prirody (*Otd. Biol.*) 63 (2), 1958 (135–45). 8 refs. [Russ.e.] C.G.B.

[Cf. *F.A.* 21 No. 4145.] Using a method described by Bykova [see *F.A.* 13 No. 138], estimates the uptake and circulation of N, CaO, MgO, K_2O, P_2O_5, SO_3, SiO_2, Fe_2O_3, Al_2O_3, and MnO in stands of Birch (20, 40, and 67 years old, site class II, density 1) which had developed on clear fellings in mature Spruce near Moscow. Data are tabulated. Up to the age of 40–50, Birch stands retain 30–50% of all the nutrients they take up; in older stands, 80–95% of the nutrients taken up are returned to the soil. The litter and humus layers contain up to 250 kg. N/ha., up to 200–240 kg. CaO, and 50–60 kg. K_2O. Annual uptakes per tree, at ages 20, 40 and 67, were respectively 33·4, 64·2, and 78·2 g. N, 41·7, 84·5, and 88·8 g. CaO, 13·9, 22·5, and 31 g. MgO, and 9·9, 19·5, and 22·7 g. K_2O. Some data are also included on the nutrient contents of the herbaceous ground vegetation.

4180. NYE, P. H. **Organic matter and nutrient cycles under moist tropical forest.** *Plant & Soil* 13 (4), 1961 (333–46). 17 refs.

In further work in this secondary forest in Ghana [see *F.A.* 21 No. 4146], additions to the soil from (*a*) litter fall, (*b*) timber fall, and (*c*) rainwash, in lb./acre/year were estimated at (*a*) N 178, P 6·5, K 61, Ca 184, Mg 40, (*b*) N 32, P 2·6, K 5, Ca 73, Mg 7, (*c*) N 11, P 3·3, K 196, Ca 26, Mg 16. A total of 9400 lb. of litter fell during the year. It contained considerably more N than that in temperate forests and decomposed extremely rapidly at 1·3%/day. Timber fall (*b*) was assessed at 10,000 lb./acre/year. Rain intercepted by and evaporated from the canopy amounted to 16%. Rain washed out of the canopy very large amounts of K and significant amounts of P and Mg, H_2CO_3 being the main anion concerned. The contribution from root decomposition and nutrient excretion from roots is unknown. Rough estimates indicate that it is comparatively small.

4181. JAIN, N. K. **Calcium relations of Sal.** *J. Indian Bot. Soc.* 39 (3), 1960 (357–72). 22 refs. O.B.D.

A study was made in the Madhya Pradesh forests of variations in Ca and ash content of leaves of *Shorea robusta* in relation to (1) soil pH, and (2) exchangeable Ca in the soil. No direct correlation of height growth with (1) or (2) could be established. The *S. robusta* soils proved to be slightly acid to neutral (pH 5–6). (2) increases from height class I to II and then declines. In the soil profile, (2) increases in the first 6 in. and then declines. Ash and Ca contents of leaves also increase from height class I to II and decrease in III and IV. There is a direct correlation between (2) and Ca content of leaves. Both Ca and ash contents are greater in mature than young leaves. The results indicate that *S. robusta* is probably not a calcifuge.

4182. GIULIMONDI, G. Ricerche preliminari sulla nutrizione minerale del pioppo a mezzo dell'analisi foliare. [**The use of foliar analysis for the investigation of mineral nutrition of Poplar.**] *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (231–45). 12 refs. [It.it.e.]

Experiments were made in foliar analysis of pot plants of *Populus* × '*canadensis*' cv. 214, grown on sterile sand and given different amounts and combinations of fertilizers. Under the conditions of the experiment, a 2% concentration of K_2O in the leaf tissues indicated deficiency, and 3·4% the optimum level. Since the N content underwent some variations under the influence of nutritional and vegetative conditions, no correlation appeared between its concentration in the leaves and the different mineral dosages. The concentration of K_2O and CaO in the leaves varied widely, though kept constant in the sand.

4183. LIEKENS, H. Gebreksverschijnselen en groeiverschillen bij populierenstekken in verband met de hoofdelementen in de voeding. [**Symptoms of nutrient deficiency and differences in growth of Poplar cuttings in relation to the main elements in the nutrient solution.**] *Repr.* from *Agricultura, Louvain* 8 (4), 1960 (663–87). 15 refs. [Du.du.f.e.]

Cuttings of *Populus* × *canadensis* cvs. 'Robusta', 'Gelrica' and 'Serotina erecta' (Regenerata?) were grown in sand culture treated weekly with nutrient solutions, complete or lacking N, P, K, Ca or Mg respectively. Deficiency symptoms for each of these elements are described. Analyses of leader growth show that N and P are essential and that Mg is the least important of the elements studied. 'Robusta' grew the most slowly. 'Serotina erecta' had a pronounced requirement for Ca, and 'Gelrica' for K.

4184. MEIDEN, H. A. VAN DER. Het onderzoek naar de betekenis van kalium voor de populier. [**Studies on the importance of K to Poplars.**] *Kali, Amsterdam* 4 (40), 1959 (371–6 + 3 photos). 3 refs. [Du.] P.O.

A study of deficiency symptoms in Poplar leaves suggests that lack of K can only be determined by leaf analysis, less than 1% K in the leaves indicating deficiency. Analysis of leaves of *Populus* × *robusta* from various areas where rust was present showed that there tended to be an inverse relation between severity of attack and contents of K.

4185. LIANI, A. Determinazione della capacità di scambio cationico delle radici di pioppo. [**Determination of the cation exchange capacity of Poplar roots.**] *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (127–38). 36 refs. [It.it.e.]

After a brief review of proposed methods for determining the cation exchange capacity (CEC) of roots, the most important effects of this property on mineral nutrition are summarized. The CEC was studied in roots of 6-month and 2-year-old plants of *Populus* × '*canadensis*' cv. 'I 154' and cv. 'I 214', grown in the field or in sand after NPK fertilizing. Ca. 3 g. of excised roots, saturated with 0·1 *N* HCl, were put into a solution of 1 *N* KCl for 2 minutes and washed; the solution was titrated with 0·04 *N* KOH, and the result of titration was taken to represent the readily exchangeable H of the roots. The relatively low CEC of Poplar roots, measured in autumn, would indicate a lower absorption of divalent (Ca, Mg) than of monovalent (Na, K) elements.

4186. LIANI, A. Prime ricerche sulla capacità di scambio cationico delle radici di eucalitto. **[Preliminary study of the cation exchange capacity of Eucalypt roots.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (247–58). 10 refs. [It.it.e.]

The method evolved for determining the cation exchange capacity (CEC) of the roots of Poplar [cf. preceding abstract] was employed, with some modifications (described in detail), in the study of Eucalypt seedlings. The results showed that the CEC of roots varies considerably from species to species and during the 2nd to 5th month of growth. *Eucalyptus globulus*, *E. trabutii*, and *E. botryoides* showed the highest values for CEC of roots, *E. maidenii* and *E. tereticornis* medium values, *E. leucoxylon* and *E. rostrata* the lowest values. The 'symmetry value' of the roots (% of K or of Ca adsorbed by the roots when the quantity of the element present is exactly equal to the proportion of readily exchangeable H) compared with their content of Ca and K, agreed in showing that *E. tereticornis* and *E. botryoides* have a greater absorption capacity for K than for Ca, whereas *E. globulus*, with a lower K/Ca ratio, behaved in an exactly opposite manner. No positive correlation was found between N content of roots and CEC.

4187. MONK, R. W. **Growth and survival of some ornamental plants on salinized soils and substrates and the resistance of their protoplasm as related to salt tolerance**. *Abstr. of thesis*, in *Dissert. Abstr.* 21 (6), 1960 (1319). O.R.S.

Eight species of annuals and 21 species of trees and shrubs (including Ponderosa Pine, Blue Spruce, Douglas Fir, Eastern Red Cedar, Black Locust, Honey Locust, Golden Willow, Black Walnut, and Little-leaf Linden) were studied in solution cultures and field plots respectively. Black Locust and Honey Locust were among the 6 perennials surviving the highest salt level (10,000 p.p.m.), Golden Willow was one of the two surviving the third level (8000 p.p.m.), while Eastern Red Cedar, Douglas Fir, Green Ash and Honeysuckle survived the second level (6000 p.p.m.). Tests by the plasmolytic or 2,3,5-triphenyltetrazolium-chloride method showed good correlation between plant species surviving and the resistance of plant tissue to salt. Ca, Mg, Na, K and P were determined on samples from the terminal 6 in. of leaves and stems of all trees and shrubs. All those grown in treated cultures contained a greater quantity of Na, and all except *Tamarix* a greater quantity of Ca, than controls. In all tree and shrub species except *Tamarix* an inverse relationship was found between salt concentration and rate of diameter growth.

4188. WAISEL, Y. **Ecological studies on *Tamarix aphylla* (L.) Karst. III. The salt economy.** *Plant & Soil* 13 (4), 1961 (356–64). 14 refs.

Cuttings set in pots containing sand had their growth depressed by concentrations of NaCl of as little as 0·1*M*. At 0·5*M*, very near the concentration in seawater, no increase in weight took place. The species is not suitable for afforestation of saline habitats. Aspects of salt excretion were studied by irrigating with NaCl, KCl, $CaCl_2$ and $MgCl_2$ solutions. The salts excreted by these plants are likely to have indicator value for soil composition.

4189. GRUZDEV, D. M. Sezonnoe razvitie i rost drevesnyh porod v orošaemyh rajonah Azerbajdžana. **[Seasonal development and growth of woody species in the irrigated regions of Azerbaijan.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (64–78). [Russ.]

Further data [cf. *F.A.* 22 Nos. 237–8] are presented on the stem and root growth of numerous species under irrigation in several parts of Azerbaijan. Irrigation in these warm areas lengthened the growing season by 10–56 days over that of the colder, non-irrigated parts of the trees' natural range, and this was reflected in increased volume growth per ha.

4190. POEL, L. W. **Soil aeration as a limiting factor in the growth of *Pteridium aquilinum* (L.) Kuhn**. *J. Ecol.* 49 (1), 1961 (107–11). 3 refs. [Cf. *F.A.* 13 No. 140.]

4191. SONN, S. W. [ZONN, S. V.]. Der Einfluss des Waldes auf die Böden. **[The effect of forest on soils.]** VEB G. Fischer Verlag, Jena. 1960. pp. 166. 23 refs. [G.g.] Transl. of "Vlijanie lesa na počvy", Izdatel'stvo Akademii Nauk SSSR, Moscow. 1954. [Russ.] Price *DM*. 14.

Three chapters have been rewritten, and three more enlarged. The background of the work is the biogeocoenotic method of study [see *F.A.* 18 No. 20], developed from the works of Morozov and, later, Sukačev. The divisions of the book, which is concerned only with the U.S.S.R., cover: a short description of the forests [of the U.S.S.R.]; modern [Soviet] concepts of forest as a complex natural formation; the relation of individual tree species to the soils; main trends in the distribution of forests, in connexion with soil conditions; the rôle of the litter and humus layer in the alteration of forest soils; the effect of tree roots on soils; some quantitative data on the circulation of organic and mineral substances between the forest vegetation and the soils; effect of forest vegetation on some properties of the soil [i.e. on the physical properties, water regime, soil air, and humus].

4192. BYKOV, B. A. Interesnyj fakt sredovlijanija (allelopatii). **[The interesting fact of allelopathy.]** *Bot. Ž.* 46 (1), 1961 (108–12). 7 refs. [Russ.]

Describes a case of allelopathy in the sparse, savanna-like woodlands of the Alma-Ata region, where exudates from *Populus pruinosa* and *P. diversifolia* cause salinification of the soil below, in the form of solonchak patches. Because of this, no, or scarcely any, herbaceous species (even halophytes) can grow under the crowns. The difficulty of placing this type of allelopathy conveniently in Grummer's classification [see *F.A.* 18 No. 1272] is pointed out, and another classification proposed, based on the chemical nature of the physiologically active products of metabolism and the way they are formed.

181.35. Special Modes of Nutrition. Symbiotic Relationships. Parasitism

See also Nos. 4067, 4698, 4700–2.

4193. Rawlings, G. B. **Some practical aspects of forest mycotrophy**. *N.Z. For. Res. Note* No. 24, 1960. pp. 8. 5 refs.

Assuming the normal relationship between tree and fungus to be symbiotic, the author discusses, *inter alia*, various practical considerations when introducing exotic tree species.

4194. Pachlewski, R., and Pachlewska, J. Badania morfologiczno-anatomiczne mikoryz sosny (*Pinus silvestris* L.) w zespołach leśnych Białowieskiego Parku Narodowego. **[Investigations on the morphology and anatomy of *P. sylvestris* mycorrhizae in the forest communities of the Białowieża National Park.]** *Prace Inst. Bad. Leśn.* No. 205/206, 1960 (3–48). 18 refs. [Pol.russ.g.]

A study on the morphology and anatomy of ectotrophic mycorrhizae of Scots Pine (seedlings and adult trees) in the (*a*) *Pinetum turfosum*, (*b*) *P.-Vaccinietum myrtilli*, and (*c*) *P.-Quercetum serratuletosum*. Mycorrhizae were most frequent in (*a*), and least frequent in (*b*); Melin's type A predominated. Light was found to have a positive influence on the formation of ectotrophic mycorrhizae. In (*a*), excess moisture caused periodic interruptions of growth; the periodic resumption of growth causes a morphological form called segment mycorrhiza (Kelley's "pearl-necklace" mycorrhiza [cf. *F.A.* 12 No. 1728]). Three different types of growth resumption in ectotrophic mycorrhizae are distinguished and described, and a new morphological form ("warty mycorrhiza") is described in Melin's type D.

181.36. Root Relations and Root Development etc.

See also Nos. 4009, 4229, 4323–4, 4631.

4195. **Seedling taproot growth appears to be influenced by average air temperature**. *Extr.* from *Rep. Rocky Mt. For. Range Exp. Sta. 1960*, 1961 (21–2).

The weekly taproot growth of Ponderosa Pine seedlings that germinated at different times during the summer, decelerated at the same time and almost to the same degree during the autumn, regardless of germination date, seedling size, or depth at which the roots were growing in the soil. Weekly growth was closely correlated with the average weekly air temperature.

4196. Orlov, A. Ja. Rost i vozrastnye izmenenija sosuščih kornej eli *Picea excelsa* Link. **[Growth and age changes of absorbing roots of *P. abies*.]** *Bot. Ž.* 45 (6), 1960 (888–96). 14 refs. [Russ.]

In continued investigations [see *F.A.* 19 No. 3948], studies were made of the formation of the absorbing root tips, their growth in length, the influence on growth of temperature and moisture in the litter-and-humus layer, and the life of the absorbing roots. Considerable variation was found in the formation of the tips, their period of growth, etc. Absorbing rootlets generally live for 3–4 years, but ca. 10% die in the first year, while ca. 20% remain alive for >4 years, and some individual rootlets for >5. Under favourable conditions, absorbing roots multiply and grow throughout the growing season, no definite periodicity being apparent. In the upper layer of the soil, root growth is limited by the temperature and moisture of the substrate.

4197. Wagenknecht, E. Beiträge zur Kenntnis der Wurzelausbildung verschiedener Bestockungen. **[The root development of various stands.]** *Mitt. StForstverw. Bayerns* No. 31, 1960 (252–74). 8 refs. [G.]

Describes research done at Eberswalde on Scots Pine, Beech, Spruce, Douglas Fir and Red Oak, in relation to site and position of tree in the stand, including some unpublished work.

4198. Jenik, J., Kubikova, J., and Sen, D. N. **Phenomenon of self-saprophytism in roots of *Tilia europaea* Linn**. *Sci. & Cult.* 27 (1), 1961 (43–5). 3 refs. E.M.B. [Cf. *F.A.* 22 No. 2873.]

4199. Denisov, A. K. Razvitie pridatočnyh kornej v pesčanom alljuvii drevesnymi i kustarnikovymi porodami južnoj tajgi. **[Development of adventitious roots in a sandy alluvium by trees and shrubs of the southern taiga.]** *Bot. Ž.* 45 (10), 1960 (1516–22). 6 refs. [Russ.]

It was found that most of the tree and shrub species (except Scots Pine) were able to develop adventitious roots when their stems were partly buried by sandy alluvium. The ability to develop adventitious roots is greatest in hydrophytes and least in xerophytes, and declines with age. The importance of these considerations when choosing trees for riverside plantings is stressed.

4200. Krasil'nikov, P. K. **Adventitious roots and the root system of *Pinus sibirica* in the Central Sayan Mountains**. *Transl. For. Prod. Lab. Can.* [No. 12, 1960.] pp. 10. 27 refs. Transl. by H. Bernard from *Bot. Ž.* 41 (8), 1956 (1194–206). [See *F.A.* 18 No. 1382.]

4201. Kozlowski, T. T., and Cooley, J. H. **Natural root grafting in northern Wisconsin**. *J. For.* 59 (2), 1961 (105–7). 10 refs.

Records intraspecific root-grafts in *Pinus strobus* and *P. resinosa*, besides the species listed previously [cf. *F.A.* 22 No. 254]. The aerial roots noted in a number of *Betula lutea* trees are also described and illustrated. These originate when seed germinates on an old stump and sends roots downwards. Eventually the stump decays, leaving the tree supported by 'stilt' roots which often become completely fused.

4202. Lanner, R. M. **Living stumps in the Sierra Nevada**. *Ecology* 42 (1), 1961 (170–3). 6 refs.

Twenty-five living stumps of *Pinus ponderosa*, *P. lambertiana*, *Pseudotsuga taxifolia*, *Libocedrus decurrens*, *Abies concolor* and *A. magnifica* were examined; most of them were the result of logging, but two resulted from windthrow. Wood laid on after felling differentiates into heartwood and sapwood. The oldest stump had persisted for 87 years; the tallest was 9 ft. high. The relation of living stumps to root-grafting is discussed.

4203. Saljaev, R. K. Korni v kore. **[Roots in bark.]** *Priroda, Moskva* 50 (2), 1961 (38). [Russ.] A.P.B.

Briefly discusses instances of roots of Scots Pine in the Leningrad region penetrating cracks in the bark of neighbouring trees, growing upwards, and reaching heights of 20–25 cm. above ground level.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 3992, 4065–6, 4192, 4244, 4248, 4311, 4665–6, 4768.

4204. **Shortleaf Pine resprouts after fire damage.** *Extr.* from *Rep. Cent. St. For. Exp. Sta. 1960*, 1961 (13).

Three-year-old planted *Pinus echinata* in Missouri were mostly top-killed after prescribed burning in 1959. During the following summer, all the trees except a few of the smaller ones (ca. 7%) produced basal coppice shoots. The larger trees generally had more and taller shoots.

4205. Krylova, I. L. Razvitie zameščajuščih pobegov u sosny i buka. **[The development of replacement shoots in *Fagus taurica* and *Pinus sylvestris* var. *hamata*.]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody* (*Otd. Biol.*) 63 (3), 1958 (105–11). 13 refs. [Russ.e.] C.G.B.

Gives the results of studies on types of replacement shoot (i.e. shoots replacing others that have been injured or killed) and their formation in the two species at the timberline in the Crimea [cf. *F.A.* 20 No. 2957]. The laws governing the development of such shoots were the same for both species but their development on Beech was less vigorous than on Pine. Shoots were replaced most completely when the damage occurred before the end of spring shoot growth.

4206. Kozlowski, T. T., and Peterson, T. A. **Cambial growth in competing Red Pine trees.** *For. Res. Note Wis. Coll. Agric.* No. 61, 1960. pp. 3 + 2 tbls. 11 refs.

The rate and time of initiation of cambial growth were studied in trees of different crown classes in 1-acre *Pinus resinosa* plots in Adams County, Wis., (*a*) unthinned, with a b.a. of 167 sq. ft., and (*b*) thinned to a spacing of 19·3% of mean dominant height, with a residual b.a. of 154 sq. ft. Comparison of d.b.h. of (*a*) and (*b*) in 1960 with d.b.h. at time of thinning in 1953 (at age 27) showed that the most significant effect of thinning was greatly accelerated cambial growth of trees classified as intermediate. During the 1960 growing season, dominant trees started growing earlier, grew faster, and grew later in the season than did intermediates. Suppressed trees grew very little. The study emphasized that delayed initiation of cambial growth and auxin deficiencies in the lower stems of small-crowned trees are important factors in competition.

4207. Zajcev, G. N. Vzaimodejstvie prorastajuščih semjan ostrolistnogo klena i robinii. **[Interaction between germinating seeds of *Acer platanoides* and *Robinia pseudoacacia*.]** *Priroda, Moskva* 49 (10), 1960 (86–7). [Russ.] A.P.B.

Brief description of a trial in which *A. platanoides* seeds delayed and reduced the germination of *R. pseudoacacia* seeds ≯ 20 cm. away, while their own germination was apparently stimulated by the proximity of the *R. pseudoacacia* seeds.

4208. Ott, E. Über den Einfluss von Flechtensäuren auf die Keimung verschiedener Baumarten. **[The effect of lichen acids on the germination of various tree seeds.]** *Schweiz. Z. Forstw.* 112 (4), 1961 (303–4). 5 refs. [G.]

A brief note on experiments with (*a*) usninic, (*b*) vulpinic, and (*c*) *d*-proto-lichesterinic acid. All species tested (Aspen, Spruce, Larch, Scots Pine and Mountain Pine) reacted unfavourably to much the same degree. At a concentration of 1/1000 only (*c*) significantly reduced germination but all three acids generally prevented development beyond the appearance of the radicle. At the medium concentration (1/10,000) most of the seedlings died. At 1/40,000 the effect was much weaker and sometimes nil. Effects varied considerably with solvent and pH. [Cf. *F.A.* 13 No. 3684.]

4209. Cannon, J. R., *et al.* **'Antibiotic effects' in plant communities.** *Nature, Lond.* 190 (4771), 1961 (189–90). 5 refs.

Failure of *Araucaria cunninghamii* to regenerate in secondary rain-forest dominated by *Backhousia angustifolia* has been observed near Maryborough, Queensland, and it was considered possible that this failure might be due to some inhibiting effect of the roots or litter of *B. angustifolia*. Laboratory tests have shown that dehydroangustione (the major constituent of the essential oil of *B. angustifolia*) hinders the germination of *Araucaria*. However, in field tests, *A. cunninghamii* seed set out on litter enriched with fresh *Backhousia* leaves containing 5·4% of dehydroangustione showed a significant increase in germination over those on natural litter. This evidence does not eliminate the possibility that in certain circumstances germination of *Araucaria* may be inhibited by the dehydroangustione present in *Backhousia* litter, but it is suggested that an investigation of the microclimatic factors affecting germination and early survival of seedlings in the field would be a more profitable line of inquiry.

4210. Gillham, M. E. **Vegetation of New Zealand shag colonies.** *Trans. Roy. Soc. N.Z.* 88 (3), 1960 (363–80 + 4 photos). 5 refs. O.R.S.

The flora of 28 shag (*Phalacrocorax* and *Stictocarbo* spp.) colonies ranging from Stewart Island in the S. to Bay of Islands in the N. was investigated, habitats being grouped in 3 categories according to the vegetation layer occupied by the shags. In colonies of ground-nesting shags, the trampling and excreta of the birds eliminated all but the most halophytic of the indigenous plants, much of the ground being bare. A third of the plant species recorded were aliens. Where shags nested in low scrub, trampling did not affect ground vegetation, and guano was less concentrated. The plant cover was specialized, <½ the species being native. In colonies of tree-nesting shags, the indigenous flora was not sufficiently damaged to be replaced by a specialized coprophilous flora, and only 23% of species were aliens. The trees most favoured as nesting sites were *Metrosideros lucida* in the S. and *M. excelsa* in the N. Quite large trees died as a result of guano deposited at the roots by ground-nesting shags or on the parts above ground by shags nesting in the branches. Death was often localized, suggesting little lateral translocation of the solutes within the plant. Xeromorphic leaves were the most resistant to damage. Necrosis of non-xeromorphic leaves of bush species, caused by guano, is described and illustrated.

181.5. Reproductive Behaviour

See also Nos. 4099–4102, 4195, 4207–9, 4239, 4304 *et seq.*, 4366 *et seq.*

4211. GUPTA, R. K. **Climate conditions and flowering season in outer Himalayas at Nainital.** *Indian For.* 87 (3), 1961 (189–93). 9 refs.

Correlates flowering season with climatic conditions as shown by temperature, dryness, and xerothermic index [cf. *F.A.* 20 No. 1352]. The greatest number of woody plants flowered in May, increasing as temperature increased from March to May. Herbaceous plants reached maximum flowering in September, a period of low rainfall.

4212. MIGITA, K. **[Influence of shading and day length on the flower bud formation of Sugi (*Cryptomeria japonica*) seedlings.]** *J. Jap. For. Soc.* 42 (2), 1960 (49–51). 7 refs. [Jap.jap.e.]

Three-year seedlings were grown at 15, 25, 50 and 100% of full sunlight from April to November, and flower-bud formation was observed in the next growing season. No flower buds formed on seedlings grown at 15% of full sunlight, and bud numbers increased with increasing sunlight. In further trials, increasing the day length increased flower-bud formation.

4213. EGGLER, W. A. **Stem growth and cone initiation in Southern Pines.** *Abstr.* in *Bull. Ecol. Soc. Amer.* 41 (4), 1960 (126–7). A.P.B.

Elongation of main stems and branches of Pines in Louisiana and Mississippi is usually the result of elongation of more than one terminal bud. The buds contributing to a season's growth of a stem normally elongate consecutively and not intermittently. Evidence from mass collections of buds and from "debudding" indicates that the time during which megasporangiate cones may be initiated is longer than has generally been believed and may exceed two months. Initiation of megasporangiate cones, following removal of terminal buds in late August, supports the conclusion that these cones are labile.

4214. BLACK, T. M. **Abnormalities of the reproductive system of *Pinus contorta* Loudon.** *Ann. Bot., Lond.* 25 (97), 1961 (21–8). 13 refs. O.R.E.

Describes various abnormalities and their occurrence within individual trees. The abnormalities (e.g. replacement of ♂ by ♀ strobili) usually occur on shoots situated in the upper crowns. The occurrence of bisexual strobili, and the proportion of ♀ tissue in them, is also apparently influenced by the proximity of normal ♀ cones. The association of abnormalities with a physiological upset caused by a shock (e.g. planting outside the natural range) is discussed, and it is concluded that the prevalence of abnormalities in trees of inland origin, and their absence from individuals of the coastal type, has some connexion with this. *From author's summary.*

4215. ŠČIČKO, V. S. Plodonošenie sosny krymskoj. **[The fruiting of *Pinus nigra* var. *caramanica*.]** *Lesn. Hoz.* 13 (11), 1960 (20–2). [Russ.]

Presents notes on its fruiting in the four altitudinal zones of the Crimea: < 300, 300–600, 600–900, and >900 m. alt. Some 655 ha. of seed stands have been marked out in the first three zones, and are expected to provide ca. 12 tons of seeds p.a. Ca. 5 tons are required annually in the Crimea itself, leaving ca. 7 tons for use in the S. Ukraine, Caucasus and Central Asia.

4216. MJAKOTINA, G. V. Nekotorye osobennosti plodonošenija kedrovnikov na severe i zapade Sajan. **[Some features of the fruiting of the *Pinus sibirica* stands in the N. and W. Sayan region.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (11–6). 5 refs. [Russ.]

[Cf. *F.A.* 22 No. 1886.] Investigations were made on 11 valley and mountain sites, in stands 100–250 years old, density 0·5–0·9, in the Krasnoyarsk region. "Nut" yield data (1949–58) are tabulated, and the relation of fruiting to tree height, d.b.h. and crown length determined. Yields were greatest in the valley stands, and there were indications that properly planned thinning would increase fruiting.

4217. USTINOVA, E. I. O ritme razvitija cvetočnyh poček u listvennyh drevesnyh porod i proleski (*Scilla sibirica* Andr.). **[The rhythm of flower bud development in hardwoods and *S. sibirica*.]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody* (*Otd. Biol.*) 63 (6), 1958 (107–15). 12 refs. [Russ. russ.e.] C.G.B.

Investigations showed that in hardwoods that flower when leafless (*Corylus avellana*, *Alnus glutinosa*, *Betula verrucosa*), pollen formation in the flower buds takes place in the summer of the year before flowering. In others, that flower and flush at the same time (Aspen, Poplar, Oak), pollen formation begins in autumn, is interrupted in the winter, and is completed in the following spring. In *Tilia cordata*, the flower buds are formed on new spring shoots, a few weeks before flowering.

4218. SCARAMUZZI, F. Ricerche sul ciclo riproduttivo di specie del genere *Quercus* della flora italiana. V. Osservazioni sul ciclo riproduttivo e sulla embriologia di *Quercus aegilops* L. **[The reproductive cycle of Italian species of *Quercus*. V. The reproductive cycle and embryology of *Q. aegilops*.]** *Ann. Accad. Ital. Sci. For.* 9, 1960 (289–322 + 11 plates). 41 refs. [It.f.]

[Cf. *F.A.* 21 No. 4036.]

4219. RAMBELLI, A. Primo contributo alla conoscenza della microflora blastomicetica dei fiori di eucalitto. **[The yeast microflora in Eucalypt flowers.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (15–26 + 4 photos). 2 refs. [It.it.e.]

Nine species of Saccharomycetes were isolated from Eucalypt flowers. There was some indication of different yeasts occurring on different sites. Investigations are continuing to determine whether there is a specific yeast flora for different species or varieties of Eucalypt.

4220. VEDEL, H. **Natural regeneration in Juniper.** *Proc. Bot. Soc. Brit. Isles* 4 (2), 1961 (146–8). 4 refs.

Observations made on the natural regeneration of *Juniperus communis* in Scandinavia lead to the conclusion that the cause of the very large and uniform areas of Juniper scrub in Scandinavia, and especially in Sweden, is to be found in effective seed dispersal and optimum conditions of germination, which are both the results of sheep grazing.

4221. ARENA, M. Sul potere di germinabilità dei semi e sulla vitalità dei semenzali di *Abies nebrodensis* (Lojac.) Mattei. **[The germinative capacity of the seed, and the survival of seedlings, of *A. nebrodensis*.]** *Ital. for. mont.* 15 (6), 1960 (247–50). 3 refs. [It.it.f.]

[Cf. *F.A.* 22 Nos. 1501, 4155.] A study of sowings in different parts of Italy indicates that seed from young trees has a higher germinative capacity than that of adult trees [only two trees were involved in the experiment]. Survival was greatest when the seed was sown at the place of origin.

4222. **Early germination important for survival of Ponderosa Pine seedlings.** *Extr.* from *Rep. Rocky Mt. For. Range Exp. Sta. 1960*, 1961 (22–3).

In Arizona, seedlings of Ponderosa Pine that start early in the year survive best. Seedlings that germinated over a 6-week period during the summer of 1957 were grown in glass-fronted boxes until late autumn. Root penetration, number of lateral roots, and seedling dry weight in Nov. were related to the time of germination—the earlier germinated seedlings were larger in all respects. Significant differences in size were found between seedlings germinating as little as a week apart. Seedlings were also grown on scalped plots from seed that germinated between July 8th and Sept. 9th. Though severe frost-heaving killed 56% of the seedlings, survival in the following May was directly related to time of germination in the preceding summer. Seedlings that started in July survived much better than those that started in August. Germination as late as August is common in Arizona.

4223. RUBCOV, V. G. Faktory sredy, vlijajuščie na prorastanie semjan sosny i razvitie vshodov v sosnjakah sfagnovyh v svjazi s osušeniem. **[Environmental factors affecting the growth of *Pinus sylvestris* seeds and seedling development in the *Pinetum sphagnosum*, in relation to drainage.]** *Bot. Ž.* 45 (6), 1960 (896–900). [Russ.]

From laboratory experiments, and investigations in a raised bog carrying Pine, site class V, in the Leningrad area, it appeared that soaking the seeds at intervals in bog water (pH = 4·2) for $\leqslant$10 days stimulated germination (92 vs. 90·5% for controls), while longer periods depressed it, e.g. 15 days gave 42·5, and 35 days only 1·2%. This pattern of germination was also reflected by weight changes in the seed with different periods of soaking. Both total germination and germinative energy fell with increasing *Sphagnum* thickness and moisture content (i.e. with increasing distance from drainage ditches). The mean rates of *Sphagnum* growth at (*a*) 3 m. and (*b*) 13 m. from a drainage channel were 0·5 cm. and 3·5 cm./year respectively; on a plot under condition (*a*), after 3 years, 96 seedlings remained out of an original 239; under condition (*b*), only 3 out of an original 102.

4224. WALKER, L. C., GREEN, R. L., and DANIELS, J. M. **Flooding and drainage effects on Slash and Loblolly Pine seedlings.** *For. Sci.* 7 (1), 1961 (2–15). 22 refs.

[Cf. *F.A.* 9 No. 2608.] The groundwater about seedlings planted in a plastic clay-loam was regulated by flooding to +8, +4 and 0, and by drainage to −4 and −8 in. One area was flooded every 3 weeks to +3 in., the plots in this area having their outlets lowered daily by ⅛, ¼, or ½ in. Mortality and height of seedlings were inversely related, the height of the terminal bud above water being critical for length of survival. Flooding to 8 in. caused severe, and to 4 in. significant, first-year losses. Slash (S) and Loblolly (L) flooded for longer than 2 and 4 months respectively will probably require replanting. Maintaining water at −4 in. produced satisfactory growth, but the best for both species at 2 years was water at −8 in. (S) withstands unfavourable water conditions better than (L); its growth following drainage after 2–8 weeks' flooding was always better than that of (L).

4225. NIENSTAEDT, H., and OLSON, J. S. **Effects of photoperiod and source on seedling growth of Eastern Hemlock.** *For. Sci.* 7 (1), 1961 (81–96). 34 refs.

Seedlings of *Tsuga canadensis* from 30 sources (Minnesota to Nova Scotia and south to Alabama) were grown under various day-length and temperature treatments. Seedlings derived from sources with long frost-free growing seasons (g.s.) tended to stop elongation and set winter buds later than those from short frost-free g.s. There was a distinct clinal variation in photoperiodic responses. Seed weight was also dependent on the length of g.s. in the source region. This correlation tended to exaggerate the regression of height on seed weight, the effect of the latter being shown by partial regression analysis to be practically negligible. Hemlock has a continuous gradation in response to night-lengths, shorter night-lengths permitting longer growth, with the critical night-lengths, showing the greater growth, probably nearer 8 hours for seedlings of short frost-free g.s. and 9 for long-season sources. Constant high or low temperatures retarded growth. The unfavourable effects of high day temperatures are countered by lower night temperatures, 27° and 17° being nearly ideal. Short-term studies of seedlings under controlled conditions may give valuable early indications of responses to environment and of the type and amount of genetic variation, separating eco- and genotypic characters in a way impossible in field progeny tests.

4226. NICHOLSON, D. I. **Light requirements of seedlings of five species of Dipterocarpaceae.** *Malay. Forester* 23 (4), 1960 (344–56 + 8 photos). 7 refs.

Seedlings were grown in plots having 100, 87·5, 75, and 50% of full daylight. Measurements were made of monthly height increment for a period of 17 months; the lighting of the 3 shaded plots was then interchanged, and measurements continued for a further 10 months. All 5 species responded positively to some shading, the order of decreasing response being *Dryobalanops lanceolata*, *Shorea leprosula*, *S. leptoclados*, *Parashorea malaanonan*, and *Dipterocarpus stellatus*. It was found, however, that after 'establishment', all species can tolerate, and grow rapidly in, 87·5% light, and probably in full light also.

4227. ENESCU, V. Vitalitatea şi ritmul de creştere al puieţilor de anin negru în primul an de viaţă. **[Vigour and growth of *Alnus glutinosa* seedlings during their first year.]** *Rev. Pădurilor* 75 (11), 1960 (644–6). [Rum.russ.g.f.e.]

Growth is very slow in the first two months. Shoot growth reaches a maximum at the beginning of October and then almost ceases; root growth continues actively through October and November.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 4103, 4205–6, 4533, 4916, 5202.

4228. COOPER, A. W. **Relationships between plant life-forms and microclimate in southeastern Michigan.** *Ecol. Monogr.* 31 (1), 1961 (31–59). 56 refs.

A study of the relationships between Raunkiær's life-forms and microclimate on N. and S. slopes in the Big Woods of the George Reserve in S.E. Michigan was made in 1957. Data from deciduous forest communities suggested that a low hemicryptophyte/geophyte (H/G) ratio was characteristic of mesic sites, and a high ratio of xeric sites. A similar, but closer, relationship was shown for the ratio of microphyllous-hemicryptophytes/mesophyllous-geophytes. The microclimatic data obtained agree with those for other studies, and emphasize the importance of topography as a factor producing variations in forest microclimates, in that the microclimates of N. slopes resembled those of mature forests, whereas comparable microclimates on S. slopes resembled those of thin forests or open areas. The life-form data agree with those of other deciduous-forest reports, but disagree with an example from the prairie/deciduous-forest transition. The data show the danger in generalizing about life-form and microclimate relations from limited numbers of slope samples. *From author's summary.*

4229. DEMENT'EVA, M. G. Nekotorye biologičeskie osobennosti ostrolistnogo klena v različnyh uslovijah mestoobitanija. **[Some biological features of *Acer platanoides* in various habitats.]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody* (*Otd. Biol.*) 63 (5), 1958 (53–63). 19 refs. [Russ. russ.f.] C.G.B.

Compares the height, diameter, volume of leaves, stem and roots, and leaf/root volume ratio of young *A. platanoides* (2, 4, 6 or 10 years) at 5 locations (14 different sites) in the U.S.S.R., from the N. limit of its range in the Vologda region to the S.E. limit in the Saratov region. Two features were the same at all the sites, viz. the change in the leaf/root volume ratio with age, and the gradual replacement of the taproot by lateral roots along with the formation of a superficial root system. Optimum conditions were found in the Tula reserve and the Moscow area.

4230. DENISOVA, L. V. K morfogenezu izvilistoj berezy. **[Morphogenesis of *Betula tortuosa*.]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody* (*Otd. Biol.*) 63 (5), 1958 (71–6). 5 refs. [Russ.russ. e.] C.G.B.

Describes investigations made in the subalpine scrub forest belt of the Khibiny Mts. to determine how multi-stemmed specimens are formed; stem mortality and replacement, rate of growth, the causes of bent and twisted stems, and the regeneration of the Birch.

4231. DRAGAVCEV, V. L. Vozrastnaja izmenčivost' černogo saksaula. **[The variability of *Haloxylon aphyllum* with age.]** *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (51–7). 26 refs. [Russ.]

Discusses the degree of branchiness of assimilating shoots (expressed as the ratio of the sum of the lengths of the lateral shoots to that of the central axis) as an indicator of age in *H. aphyllum*, and graphs the variation in branchiness with age in three different stand types. Discusses the variation in cambial activity in stem and branches, showing graphically the number of growth rings against diameter at three different points in the tree.

4232. MIEGROET, M. VAN. Étude morphologique de quelques types de peupliers au stade juvénile. **[A morphological study of some types of Poplar in the juvenile stage.]** *Bull. Soc. For. Belg.* 68 (4), 1961 (225–39). [F.]

Nursery stock of several commonly grown Poplars was studied and compared in the hope of discovering likenesses and differences, and possiby establishing genetical relationships. The Poplars studied were *Populus* × *canadensis* cvs. (*a*) 'Robusta', (*b*) 'Missouriensis imp. holl.', (*c*) 'Gelrica', (*d*) 'Serotina', (*e*) 'Serotina erecta', (*f*) 'Bleu d'Eksaarde'. The characters studied were height and diameter growth of stem, form factor and length of clear stem; length, angle, diameter and quantity of branches; crown diameter, crown length, and crown-diam./length ratio. The results indicate that the Poplars studied can be divided into two groups: (1) consisting of (*a*) and (*b*), inferior in all the characters studied, and (2) comprising (*c*)–(*f*), superior in these characters. Group (2) may again be subdivided into two parts, probably indicating genetic relationship, consisting of (*c*) and (*f*) on the one hand and (*d*) and (*e*) on the other. The morphological differences appear to correspond to differences in ight requirements, (*a*) and (*b*) being the most, (*d*) and (*e*) the least light-demanding, with (*c*) and (*f*) intermediate.

4233. Grudzinskaja, I. A. Letnee pobegoobrazovanie u drevesnyh rastenij i ego klassifikacija. **[Formation of Lammas shoots in woody plants, and its classification.]** *Bot. Ž.* 45 (7), 1960 (968–78). 14 refs. [Russ.e.]

Distinguishes two types of shoot formation: (I) natural regular formation corresponding to the climatic conditions of the cool-temperate zone, and (II) recuperative formation occurring as a result of damage to the plant or abrupt changes in environmental conditions. Type (I) comprises: (1) spring shoot formation associated with the periodicity of climate; and (2) correlative or supplementary regular formation of summer shoots depending on correlations between growth and leaf formation for a definite ratio of active root surface to active leaf surface (this subtype is further subdivided). Type (II) comprises (1) regenerative shoot formation induced by damage, and (2) pseudo-correlative shoot formation stimulated by the increase of the active root surface due to abrupt changes in environmental conditions. *From author's summary.*

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also Nos. 4231–2, 4369, 4421–2.

4234. Dixon, D. **AFA's social register of big trees. These are the champs.** *Amer. Forests* 67 (1; 2), 1961 (40–50; 41–7).

A list showing the largest known specimen of each of 355 native American tree species, based on records sent to the American Forestry Association since the publication in 1956 of the last report on their Big Tree Campaign. Data given include common and Latin names, locality, girth at 4½ ft., height, and crown spread.

181.8. Phenology

See also Nos. 4056–7, 4061, 4071, 4078, 4099, 4101, 4116, 4152, 4164–5, 4211, 4217–8, 4227, 4233, 4357, 4923, 4998–5000.

4235. Medvedev, P. M. O vynuždennom pokoe u rastenij Hibin. **[Induced dormancy in plants of the Khibiny Mts. [Kola Peninsula].]** *Bot. Ž.* 46 (1), 1961 (61–9). 12 refs. [Russ.russ.e.]

Tabulates, for 63 species (trees, shrubs, subshrubs, and herbaceous plants), from the Khibiny Mts., the period necessary to break dormancy in shoots taken at different times of the year, when kept in the laboratory at air temperatures of 5–20° C. The period of organic (biological) dormancy varies with species, and in nature most of these are in a state of induced dormancy during a significant part of the 8-month polar winter, as is evidenced by: (*a*) secondary growth in the autumn under favourable conditions; (*b*) the plants being prepared in the winter for new growth; and (*c*) herbaceous plants overwintering with green leaves.

4236. Smirnov, V. V. Raspredelenie hvoi po ee vozrastam u *Picea excelsa* Link v elovyh i elovolistvennyh drevostojah taežnoj zony. **[Needle distribution by age in *P. abies*, in pure stands and Spruce/hardwood stands of the taiga zone.]** *Bot. Ž.* 45 (10), 1960 (1522–30). 8 refs. [Russ.]

Sample trees were chosen by diameter classes from (*a*) the *Piceetum herboso-hylocomiosum* (Vologda region; mean stand age 18, 37, 58, 105, and 130 years) and (*b*) the *P. oxalidosum* (Novgorod region; 22, and 75 years). The moisture content of the needles in relation to needle age, and the distribution of needles by age were determined, and some of the results are tabulated and graphed. In (*a*), needles frequently remained on the twigs for 11–12 years, and sometimes even up to 14, whereas in (*b*) 10 years, or more rarely 11, was the maximum. In other words, the better the conditions of growth, the less the persistence of the needles.

4237. Prokazin, E. P. K voprosu o vozniknovenii rannego i pozdnego raspuskanija list'ev u duba čereščatogo. **[The problem of the origin of early and late flushing in *Quercus robur*.]** *Lesn. Ž. Arhangel'sk* 3 (4), 1960 (26–31). [Russ.]

Studies were made of Oak phenology and environmental conditions in 45-year-old plantations on a plateau and on a slope, in the Tula reserve. On the whole, the plateau was colder, moister and less fertile, and was occupied by early-flushing forms; the slope was warmer, drier and more fertile, and occupied by late-flushing forms. It is argued that ecological conditions have caused the development of early and late flushing in stands from homogeneous seed. The main factors involved are held to be the temperature of the soil and air, especially in the early part of the growing season. [Cf. *F.A.* 22 No. 4056.]

182. Synecology, Plant Sociology: General, Principles and Methods

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 4034, 4263, 4277, 4812.

4238. Sangster, A. G., and Dale, H. M. **A preliminary study of differential pollen grain preservation.** *Canad. J. Bot.* 39 (1), 1961 (35–43). 7 refs. O.R.S.

Samples of pollen of 3 genera (from *Populus tremuloides*, *Pinus strobus*, and *Typha latifolia*), normally shed at different times during the growing season, were placed concurrently in 4 habitats in Ontario (pond, lake, swamp, and bog). Their decomposition was traced through the summer and autumn of two consecutive years. There was considerable variability in fossilization of pollen under identical conditions, and the decomposition of a given pollen was dependent on the habitat, which affects not only the rate of decomposition but also the processes involved. *From authors' summary.*

4239. Potter, L. D., and Rowley, J. **Pollen rain and vegetation, San Augustin Plains, New Mexico.** *Bot. Gaz.* 122 (1), 1960 (1–25). 78 refs. O.B.D.

A series of 8 pollen-collecting stations was established across the San Augustin Plains of New Mexico, and the pollen deposits during the 1956 season were examined from slides exposed for (1) 24-hr. and (2) 7-day periods. Tree pollen formed 71–99% of the pollen deposited at the 8 stations, though they were all sited in open country. Average composition of tree pollen was: *Juniperus* spp. 61%, *Pinus* spp. 26%, *Quercus* spp. 9%, other species 4%, and this shows a correlation with relative b.a. of tree species in forested areas in the same region, viz.: *Juniperus* spp. 40%, *Pinus* spp. 50%, *Quercus* spp. 9% and others 1%, though at all stations *Juniperus* spp. were over-represented and *Pinus* spp. were under-represented. It was concluded that if shrubby vegetation is involved at the sampling site, a % of tree pollen exceeding 40–50% of the total indicates a forest border within a few miles. In grassland areas, however, tree pollen may exceed 90% even when forest areas are relatively distant. Maximum deposits were found in the last week of March for *Juniperus*, the first week of May for *Quercus*, and mid-June for *Pinus*. The general composition of pollen deposits was about equal for (1) and (2), but (1) did not give as complete a record of pollen from rare species or of long-distance transport. Pollen of *Abies* spp. and *Pseudotsuga* spp. was relatively infrequent; the latter is known to travel only short distances. Pollen of *Picea* spp. was represented by only 2 grains in all samples, although a large stand exists about 14 miles to the S.W. An analysis of moss and lichen polsters revealed a good correlation with surrounding tree cover. An analysis of surface-silt samples with a pH of 9+ also yielded pollen. Comparison of the latter with the current pollen deposit showed that *Juniperus* pollen is not well preserved.

4240. McVean, D. N. **Flora and vegetation of the islands of St. Kilda and North Rona in 1958**. *J. Ecol.* 49 (1), 1961 (39–54). 10 refs.

Maps the principal plant communities, with lists of species and descriptions of soils. Changes in the vegetation of St. Kilda since the human population left in 1930 are discussed, and the plant covers of Hirta and North Rona compared. Pollen analysis of peats from 3 sites on Hirta showed that St. Kilda once had a partial cover of Birch/Hazel scrub, reaching its maximum extent at the climatic optimum. Pollen of other tree species (Pine, Elm, Oak, Alder, Beech) was also present.

4241. Morrison, M. E. S. **Pollen analysis in Uganda**. *Nature, Lond.* 190 (4775), 1961 (483–6). 14 refs.

Gives some account of the location and type of deposits suitable for pollen analysis in Uganda, and illustrates and discusses the analysis of a profile from Muchoya fen, showing the relation of *Hagenia* sp. and *Stoebe* sp. The possible causes for the replacement of *Hagenia* forest by the present more or less pure Bamboo (*Arundinaria* sp.) are discussed.

4242. Safarov, I. S. O svjazi meždu lesami tropikov i Talyša. [**The relationship between tropical forests and those of the Talysh Mts. [Azerbaijan].**] *Bot. Ž.* 45 (8), 1960 (1097–1107). 35 refs. [Russ.e.]

Studies the structural similarities between the forests of the Hyrcanian belt of the Talysh and tropical forests (viz. rich species composition; the occurrence of several equally dominant tree species in the forest canopy; many storeys; the presence of lianes and epiphytes; abundance of fern species; development of buttresses), and also the hereditary features of a number of Hyrcanian relict species. The indications are that, in the past, there existed floristic intercommunication between the Talysh forests and the forests of the tropics.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 4272–4, 4277, 4539, 4635.

4243. Leibundgut, H. Risultati delle ricerche in foreste vergini europee. [**Results of research in European virgin forests.**] *Ital. for. mont.* 15 (6), 1960 (213–9 + 14 photos, 3 gphs.). [It.it.]

A lecture given to the Italian Academy of Forest Sciences, outlining the evolution from pioneer communities to climax forest, and the decadence of the overmature forest. The illustrations include 8 coloured photographs of different stages in the evolution of mixed climax forest.

4244. Barry, J.-P. Contribution à l'étude de la végétation de la région de Nîmes. [**The vegetation of the Nîmes region.**] *Année biol.* 36 (7/12), 1960 (311–550 + 39 plates). 14 pp. of refs. [F.] O.R.S.

The main part of the work is in two sections, showing the development of vegetation on old agricultural land and its development following the destruction or modification by fire or erosion of the climax Oak forests (*Quercus ilex* and *Q. pubescens*).

4245. Glazyrin, V. M. Formirovanie i razvitie složnyh kolkov v predelah severnoj časti Turgajskogo plato. [**Formation and development of the mixed forest outliers (*kolki*) in the N. part of the Turgai plateau [Kazakhstan].**] *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (24–9). 3 refs. [Russ.]

The *kolki* are natural outliers of forest in the steppe, found mainly on light sandy soils. They originate with the establishment of shrubs, after which Aspen and/or Birch come in as pioneers, followed by Scots Pine, the last often forming dense pure stands. With protection from fire, grazing, etc., the forest 'islands' increase in size, the succession proceeding as above. Skilful tending and thinning can accelerate succession in the desired direction and favour natural extension of the 'islands'.

4246. Pearson, P. R., Jr. **Succession in New Jersey forests occurring on limestone.** *Abstr.* in *Bull. Ecol. Soc. Amer.* 41 (4), 1960 (118). A.P.B.

Studies were made, in 14 stands, of the composition of upland forests on calcareous substrata in or near the Great Appalachian Valley in northern New Jersey. Only four species appeared as dominants in these stands, and three types of forest were recognized, dominated by: (1) *Quercus alba* and *Q. velutina*, (2) *Acer saccharum*, and (3) *Tsuga canadensis*.

A study of regeneration indicated that (2) and (3) will extend their area of dominance.

4247. SCHOFIELD, W. B. **The ecotone between Spruce-Fir and deciduous forest in the Great Smoky Mountains.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (6), 1960 (1347–8). O.R.S.

Characterizes the ecotone and relates it to climate, to environmental tolerances of component tree species, and to the historical development of the vegetation.

4248. RIDLEY, W. F., and GARDNER, A. **Fires in rain forest.** *Aust. J. Sci.* 23 (7), 1961 (227–8). 9 refs. O.R.S.

Discusses the frequent penetration and destruction of rain forest by bush fires during periods of drought in the subcoastal foothills of S.E. Queensland, and the subsequent colonization of burned areas. The colonizers are mainly introduced species of which *Lantana* spp., and particularly *L. camara*, occur frequently, forming treeless thickets. Native colonizers include *Trema aspera*, *Codonocarpus australis*, *Scaria* spp., and *Eucalyptus drepanophylla* and *E. crebra*.

182.4. Layer Communities

See also Nos. 4252, 4265–7.

4249. MEES, G. La végétation épiphytique de la vallée de la Semois en relation avec la végétation forestière. **[The epiphyte vegetation of the Semois valley in relation to the forest vegetation.]** *Bull. Soc. Bot. Belge* 92 (1/2), 1960 (77–95). 16 refs. [F.] O.B.D.

Observations are presented on the vegetation and associated epiphyte communities, with a table in which are listed each forest type with its main epiphyte community and other typical ecological and floristic characteristics.

4250. LEMON, P. C., and VOEGELI, J. M. ***Pieris phillyreifolia*** **(Hook.) DC., an unusual epiphyte growing in Cypress inner bark.** *Abstr.* in *Bull. Ecol. Soc. Amer.* 41 (4), 1960 (127–8). A.P.B.

P. phillyreifolia (*Ampelothamnus phillyreifolia*) is the only climber among the North American Ericaceae. The vigorous growing tips ascend Cypress trees by forcing upwards in the inner bark, almost touching live phloem. At intervals leafy shoots extend outwards from the Cypress trunks, reaching 25 ft. or more up the trees. The host is nearly always *Taxodium ascendens*; the plant has also been found, though rarely, on *Pinus elliottii* to a height of 5 ft., and on rotting stumps. It is a minor species in the ecological sense, though its seeds are useful to birds and small mammals of the *Taxodium*/*Pinus* community in coastal plain wetland succession.

4251. TADINI, G. Muschi forestali e associazioni di briofite dei boschi della regione cusiana. **[Forest mosses and associations of bryophytes in the woods of the Cusio region.]** *Nuovo G. bot. ital.* (*n.s.*) 66 (3), 1959 (385–437). 60 refs. [It.it.e.f.] A.P.B.

182.5. Synecological Measurements and Methods

See also Nos. 4270, 4916.

4252. **Techniques and methods of measuring understory vegetation. Proceedings of a Symposium at Tifton, Georgia, October 1958.** Southern Forest Experiment Station, New Orleans; Southeastern Forest Research Station, Asheville. 1959. pp. 174. 19 pp. of refs.

Contains 24 papers, mainly reviews of practical (e.g. herbage production) or theoretical (e.g. terminology and statistics) aspects, including papers on: Aerial photographs as a means of measuring plant cover and composition (*R. W. Rich*) [photos were used to classify stands for subsequent ground sampling, which did not reveal significant differences in ground-cover density within tree species, height or crown-closure classes, except between pure softwood stands with >50% closure and all other forest types]; Evaluating understory plant cover from aerial photographs (*G. Avery*) [suggesting the use of oblique photos taken from helicopters]; The influence of vegetational layers on cover measurements (*P. C. Guilkey*); Description and measurement of the forest floor (*L. J. Metz*); Sampling forest floors and soils in the Arkansas highlands (*J. L. Smith*); and Sampling the production of fruits and seeds of woody and herbaceous plants (*H. S. Crawford*).

4253. GIACOMINI, V. La cartografia della vegetazione per la conoscenza della vegetazione forestale. **[Vegetation mapping for the study of forest vegetation.]** *Ann. Accad. Ital. Sci. For.* 9, 1960 (323–56). 80 refs. [It.f.]

Discusses the question of vegetation mapping and the peculiar problems it raises in relation to conventional cartography.

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

4254. HENZLIK, R. E. **A study of the animal ecology of a man-made forest in the Nebraska sandhills.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (6), 1960 (1672). O.R.S.

The area is one where conifer stands, planted within the last 55 years, have been superimposed on the indigenous vegetation—post-climax tall-grass prairie. They have reduced the wind velocity, light intensity, radiant energy and evaporation, but neither mean temperatures nor relative humidities significantly, though the range of values for both has been restricted. The conifers proved to be changing the soil chemically towards that of a typical conifer forest. Edaphon species [soil dwellers] were relatively scarce, with populations higher on the prairie than in the forest; they were representative of those common in sandy soil. Major influents of the litter-layer societies are Collembola and Oribatei, found mainly within the forest. Ground-surface arthropod influents belong to the families Formicidae, Mutillidae, Carabidae, Lycidae, Staphylinidae, Lycosidae, Cicindelidae and Phalangiidae. There are definite indicator species among the epigeic [surface] fauna, some preferring open prairie and others forest. The herb/shrub stratum contains a great number and variety of species, with different influents characterizing the forest and prairie. In the tree (*Pinus banksiana*) stratum, *Cinara pergandei* is the most prominent influent. Locality data for 60 species (59 arthropods, one lichen) reveal a significant correspondence between their previous range and distribution and the forest formations from which seedlings for the Nebraska Forest project were imported. It is concluded that some of these were accidentally introduced with the tree stock. The major influents of the ecosystem are the mule deer, Virginia deer and domestic cattle, which have modified the upper soil layers and interfered with the ecesis of the conifer dominants.

187. Vegetation Types

See also Nos. 3970, 3974–6, 3986–8, 3999, 4000, 4012–3, 4020–1, 4146, 4172, 4180, 4191, 4242–9, 4332, 4902, 4914, 5299, 5302.

4255. Hofmann, A. Note preliminari su una associazione del pino marittimo. **[Preliminary note on a *Pinus pinaster* association.]** *Ital. for. mont.* 15 (6), 1960 (232–46). 15 refs. [It.f.]

Describes and analyses a stand of *P. pinaster* in the province of Savona, which occurs in the midst of a broadleaved deciduous forest that is the natural climax in this area. The Pines occur on degraded serpentine soils, the upper horizons of which have almost disappeared, producing a peculiar geo-pedological situation. There is an absence of typical Mediterranean ground flora, and the phytocoenosis is a sub-association of *P. pinaster* and Euphorbiaceae (*Euphorbieto-Pinetum*).

4256. Rivas Goday, S., *et al.* Contribución al estudio de la *Quercetea ilicis hispanica*. Conexión de las comunidades hispánicas con *Quercus lusitanica* s.l. y sus correlaciones con las alianzas de *Quercetalia ilicis*, *Quercetalia pubescentis* y *Quercetalia robori-petraea*. **[Contribution to the study of the *Quercetea ilicis hispanica*. Connexion of the Spanish communities with *Q. lusitanica* s.l. and their relationship to the alliances of *Quercetalia ilicis*, *Quercetalia pubescentis* and *Quercetalia robori-petraea*.]** *An. Inst. Bot. A. J. Cavanilles* 17 (2), 1959 (285–406 + 1 map + 20 tbls.). 55 refs. [Span.span.] O.B.D.

4257. Grebenščikov, O. S. Rastitel′nost′ Afonskogo poluostrova (Grecija). **[The vegetation of the Athos peninsula (Greece).]** *Bot. Ž.* 45 (8), 1960 (1178–84). 15 refs. [Russ.]

Describes the following zones: (*A*) evergreen subtropical woody vegetation, including deciduous forests with an evergreen underwood (0–300 (–600) m. alt.); (*B*) foothill Oak and mesophile montane mixed forests (300–1200 m.); (*C*) fragments of mixed forest (*Abies alba* var. *acutifolia*, *Pinus nigra* var. *caramanica*, *Juniperus foetidissima*)—dry, montane, Mediterranean coniferous forests (1200–1800 m.); (*D*) montane xerothermic suffruticose vegetation (1800–2033 m.).

4258. Alexandrowicz, B. W. Lasobory Beskidu Śląskiego. **[Conifer/hardwood forests of the Silesian Beskid Mts.]** *Prace Inst. Bad. Leśn.* No. 205/206, 1960 (49–81 + 1 map). 14 refs. [Pol. russ.g.]

Distinguishes various types of coniferous and mixed forests found at different altitudes, and presents data on the composition of the vegetation in mixed forests at the lower and medium altitudes (up to 1100 m.).

4259. Norin, B. N. Čto takoe lesotundra? **[What is the "forest-tundra"?]** *Bot. Ž.* 46 (1), 1961 (21–38). 97 refs. [Russ.e.]

The "forest-tundra" is considered by most geobotanists and geographers to be a subzone, a belt transitional between the tundra and taiga. However, the author argues that the vegetation, climate, soils, etc. form a special forest-tundra zone in the N. of Eurasia. Various Soviet schemes of the vegetation zones of the N. of the U.S.S.R. are mapped and discussed, and extensive Soviet literature on the history of the formation of the forest-tundra is reviewed. The special forest-tundra type of vegetation (areas of sparse and/or dwarf forest separated by bogs) has the following characteristics: a sparse, open stand of trees, but a closed tree-root system; considerable influence of tree roots on the soil, but very little crown influence, which allows free development of the light-loving tundra flora; "forest" and "tundra" elements present in the forest, forming a complex mosaic vegetation cover; special ecological life forms (dwarf trees, semi-procumbents, etc.); and a special hypo-arctic floristic element.

4260. Sočava, V. B., Isačenko, T. I., and Karpenko, A. S. Zonal′noe razdelenie sovetskoj Pribaltiki na osnove srednemasštabnoj geobotaničeskoj karty. **[Division of the Baltic Soviet Republics into zones based on the medium-scale geobotanical map of this region.]** *Bot. Ž.* 45 (6), 1960 (795–804). 30 refs. [Russ.e.]

Distinguishes, and demarcates on a map, 54 geobotanical regions in (1) central taiga; (2) southern taiga; (3) N., and (4) S. parts of the broadleaved/coniferous forest region. Both (3) and (4) are subdivided into maritime and subcontinental regions. The controversial question of the location of the boundary between taiga and broadleaved/coniferous forest is especially discussed.

4261. Jurkevič, I. D., and Gel′tman, V. S. Rajonirovanie lesnoj rastitel′nosti BSSR. **[Dividing the forests of Belorussia into forest growth regions.]** *Bot. Ž.* 45 (8), 1960 (1132–46). 22 refs. [Russ.e.]

Distinguishes three subzones: (I) Spruce/broadleaved forests (3 regions); (II) Oak forests with Spruce and Hornbeam (2 regions); (III) Oak forest with Hornbeam (2 regions). The subzones and regions are marked on a map, and a tabulated description is given of the climate, relief, hydrography, and soils of each region.

4262. Koldanov, V. Ja., and Solov′ev, K. P. Kedrovye lesa uezda Ičun′ Kitajskoj narodnoj respubliki. **[*Pinus koraiensis* forests of the Ichun region in the Chinese People's Republic.]** *Lesn. Ž., Arhangel′sk* 3 (3), 1960 (166–73). [Russ.]

[Cf. *F.A.* 20 No. 2994.] The forests are in the N.E. of Heilungkiang province in the Little Hingan mountains. The size, age, rate of growth, and fruiting of *P. koraiensis* in the region are outlined, and a detailed table is given showing, for seven forest types, the number of storeys, composition, site conditions and class, age, d.b.h., height, number of stems/ha., standing volume/ha., regeneration/ha., and additional notes of interest. The forest types are: (*A*) moist *P. koraiensis* forests on the best developed soils, (1) shrubby with some Spruce, (2) with Maple and Hazel, (3) shrubby with *Abies nephrolepis*; (*B*) fresh *P. koraiensis* forests on shallow soils, (1) with Hazel and some *Tilia*, (2) with Yellow Birch and shrubs; and (*C*) *P. koraiensis* forests suffering periodically from insufficient moisture, (1) with sedges and *Rhododendron*, (2) with Hazel and *Lespedeza*. Regeneration after various types of felling is discussed. Shelterwood or selection systems are advised where economically possible, and clear fellings should not in any case be wider than 200–300 m. Recommendations are made on forest tree species suitable for the various sites of the region.

4263. USLU, S. Untersuchungen zum anthropogenen Charakter der zentralanatolischen Steppe. **[The man-made character of the central Anatolian steppe.]** *Giessener Abhandlungen zur Agrar- und Wirtschaftsforschung des Europäischen Ostens, Giessen* 12, 1960. pp. 71 + 70 photos + 4 tbls. 79 refs. [G.]

A fuller version of a paper first published in Turkey [cf. *F.A.* 20 No. 2972] followed by recommendations for the conservation and rehabilitation of such forests as still exist. These include the formation of a "drought control authority" with wide powers over land use, restriction of grazing, and even large-scale resettlement of populations.

4264. L′VOV, P. L. Kratkij očerk lesnoj rastitel′nosti del′ty reki Samur Dagestanskoj ASSR. **[Short survey of the forest vegetation of the Samur delta, Dagestan.]** *Bot. Ž.* 46 (1), 1961 (102–7). 8 refs. [Russ.]

[Cf. *F.A.* 21 Nos. 45, 2909.] The forests are of the mixed broadleaved type (with Oaks, Hornbeam, Alders, Poplars, Maples, etc.), a shrub layer, and abundant lianes. Several forest types are described, and the performance of several exotics (e.g. *Eucommia ulmoides, Phellodendron amurense*, fruit trees and ornamentals) in the delta is also briefly discussed.

4265. ROTŠIL′D, E. V. Mozaičnost′ rastitel′nogo pokrova pustyni, voznikajuščaja pod vlijaniem derev′ev i kustarnikov. **[The mosaic pattern of desert plant cover under the influence of trees and shrubs.]** *Bot. Ž.* 45 (12), 1960 (1750–70). 30 refs. [Russ.e.]

An analysis of the plant cover under *Haloxylon aphyllum*, and also *H. persicum* and *Tamarix* spp. in the Kyzyl-Kum, Kara-Kum and Turanian deserts.

4266. SHANKARNARAYAN, K. A. **The vegetation of Tirunelveli District.** *J. Indian Bot. Soc.* 39 (3), 1960 (474–9). 7 refs. O.B.D.

The forests of Tirunelveli, 394 miles S.W. of Madras may be divided according to Champion's classification into (1) southern thorn, (2) southern dry deciduous, (3) southern moist deciduous, and (4) southern evergreen forest. Data are presented on the occurrence of these types and the species composition of the layer communities.

4267. BHATNAGAR, H. P. **Phytosociological studies in types of Sal forests of U.P.** *J. Indian Bot. Soc.* 39 (3), 1960 (386–401). 14 refs. O.B.D.

The study was carried out in some A_1, A_2, B_3 and B_4 types of Sal forest (Champion's classification). In all, 290 species belonging to 56 families were collected and 7 different plant communities recognized. The species are listed with an assessment of their dominance and sociability in each of the 7 communities, and also of their occurrence in each of the forest types. *S. robusta* is the most dominant species of these forests, with high frequency, density, and sociability, covering ca. ¾ of the area. Other tree species, that are characteristic of a particular community, attain high dominance and sociability only in the community that they characterize. In the lower storey, *Mallotus philippinensis* is the most dominant species in all 7 communities, with a dominance and sociability index attaining a maximum value of 3·2. *Clerodendron infortunatum* occurs in all communities, and with high dominance and sociability in moist Sal type communities.

4268. AGRAWAL, S. C. **Grassland communities in moist tropical forests.** *Indian For.* 87 (2), 1961 (94–100). 17 refs.

Using Champion's forest types, an account is given of the ecology and distribution of grassland communities in India in sub-divisions under the main headings: moist tropical forest; tropical semi-evergreen forest; and seral forests.

4269. RAJA SINGH, G. J. **A contribution to the knowledge of tropical wet evergreen forests—the *sholas* of Papanasam Hills in Madras State.** *Indian For.* 87 (2), 1961 (77–86). 7 refs.

The evergreen *sholas* of the Papanasam Hills, in the Western Ghats, range from 2000 to 4500 ft. alt., with an annual rainfall of 120–200 in. Data from 2 sample plots indicate an average standing volume of timber of >10,000 cu. ft./acre. The floristic composition and ecological characteristics of the climatic climaxes are shown, with observations on edaphic variants and the status of a pure reed climax. Notes are given on two species peculiar to the *sholas*—*Gluta travancorica* and *Balanocarpus utilis*.

4270. **Proceedings of the Symposium on Humid Tropics Vegetation, Tjiawi (Indonesia) December 1958.** Unesco Science Cooperation Office for South East Asia. [*n.d.*] pp. 312 + 2 gphs., 1 dgm., 6 maps, 16 photos.

Includes progress reports on vegetation studies in Indonesia, Borneo, Malaya, Ceylon, India and Pacific Islands, and the following papers: On the possibility of a rational general classification of humid tropical vegetation (*F. R. Fosberg*); Notes on the classification of vegetation (*H. B. Gilliland* and *Muhammad bin Jabil*); Vegetation mapping as part of the land resources surveys carried out by the CSIRO in the territory of Papua and New Guinea (*R. G. Robbins* and *H. A. Haankjens*); Recent advances in the application of aerial photography to the study of tropical vegetation (*R. A. de Rosayro*); A new approach to the study of tropical vegetation in the field (*Y. Satyanarayan*); The role of vegetation studies in land classification (*B. W. Taylor* and *R. O. Whyte*); Methods used for the ecological study of Malayan forest vegetation (*J. Wyatt-Smith*); Observations on the ecology of the peat-swamp forests of Sarawak and Brunei (*J. A. R. Anderson*); Notes on the primary vegetation and soils of Brunei (*P. S. Ashton*); Secondary growth on areas of peat swamp forest (*A. J. G. H. Kostermans*); Vegetation of Thailand and its correlation with climate and soil type (*K. Suvatabandhu*); Montane formations in the central highlands of New Guinea (*R. G. Robbins*); Ecological studies of the evergreen vegetation of the Western Ghats (*Y. Satyanarayan*); Discrimination of tropical shore formation (*C. G. G. J. van Steenis*); Bioclimatology of Indonesia in relation to vegetation (*H. C. Trimble*); Recent studies in tropical rainforest, North Queensland (*L. J. Webb*); A study of vegetation of Eastern New Guinea (*J. S. Womersley*); The *Araucaria* forest of New Guinea—a unique vegetation type in Malaysia (*J. S. Womersley*); An area of disturbed forest [in Malaya] (*P. R. Wycherley* and *V. K. B. Nair*); Notes on the spread of *Croton hirtus* (*P. R. Wycherley*); The influence of original vegetation on silviculture in North Borneo (*D. I. Nicholson*); Silvicultural aspects of the tropical rainforest in Indonesia (*Moersaid* and *R. Soediarto*); Development of a silvicultural system for the conversion of natural inland lowland evergreen forest of Malaya (*J. Wyatt-Smith*).

4271. **Humid tropics research: Tropical soils and vegetation (Proceedings of the Abidjan Symposium) [20-24 Oct. 1959].** United Nations Educational, Scientific and Cultural Organization, Paris. 1961. pp. 115 + 8 photos. Many refs. [E. or F., f. or e.]

Includes the following papers: The types of vegetation of the humid tropics in relation to the soil (*P. W. Richards*); Effect of soil characteristics on the localization of vegetation in equatorial and humid tropical regions (*G. Lemée*); Influence of various types of vegetation on the characteristics and evolution of soils in equatorial, sub-equatorial and adjacent semi-humid tropical regions (*G. Aubert*); Influence of cultivation on the evolution of soils in dense forests at low and intermediate altitudes (*J. d'Hoore*); Some effects of natural vegetation on the soils of West Africa and on their development under cultivation (*P. H. Nye*); The pedological aspects of the reclamation of tropical, and particularly volcanic, soils in humid regions (*F. A. van Baren*); Subtropical forests of Transcaucasia, their origin and the methods of economic exploitation (*V. Z. Gulisashvili*); Soil-vegetation relationships in the western forest areas of Ghana (*P. M. Ahn*); Classification of the vegetation of the high forest zone of Ghana (*J. W. C. Mooney*); The vegetation of the lowlands of Ceylon in relation to soil (*B. A. Abeywickrama*); Vegetation and soil in tropical and subtropical India (*G. S. Puri*); Aspects of soil-water-plant relationship in connexion with some Brazilian types of vegetation (*M. G. Feni*).

4272. NANSON, A., and GENNART, M. Contribution à l'étude du climax et en particulier du pédoclimax en forêt équatoriale congolaise. **[The study of climax, and in particular soil climax, in the equatorial forest of the Congo.]** *Bull. Inst. Agron. Gembloux* 28 (3), 1960 (287–342). 35 refs. [F.f.e.] E.M.B.

The studies were made on (1) land fallowed after cultivation, (2) young secondary forest, (3) old secondary forest, (4) semi-evergreen forest, (5) *Brachystegia laurentii* (presumably climax) forest, and also (6) the paraclimax forest of *Gilbertiodendron dewevrei.* They were, as far as possible, restricted to the same soil series. At the chosen stations, data were collected on (i) vegetation, i.e. number of species, life forms, chorology, dissemination of diaspores, ecological and phytosociological groups, (ii) microclimate, and (iii) soils. The evolution of the vegetation is characterized by an increase in the proportion of phanerophytes over chamaephytes and geophytes, and of aerially disseminated over animal-disseminated species. Number of species per unit surface area reaches a maximum in old secondary forest, and then decreases until the climax. The climax character of (5) was confirmed. Its relatively restricted area in comparison with (4) may be partly explained by the latter's ability to regenerate by groups, and the limited ability of *B. laurentii* (aerially disseminated) to spread. In the course of succession, saturation deficit, evaporation potential, and relative illumination diminish. Temperature at ground level seems stable from (1) onwards. From the pedological point of view, succession is characterized by a reduction in the thickness of the soil horizons, and by a tendency for living soil organisms to concentrate increasingly near the surface. This process is accompanied by an intensive development of mycorrhizae in the A_0 layer. From the macromorphological point of view humification under (1) resembles the "mull" of temperate climates, while under (5) it resembles "moder". Micromorphological observations show a decrease in the diam. of humus particles with succession. Acidity increases with succession; in (5) the pH is at a maximum in the H_{1-2} layers. Exchangeable H follows a similar pattern. The degree of base saturation decreases with succession, while its vertical pattern of distribution follows that of pH. Ca, which is the most important cation in the early stages, diminishes rapidly, being apparently removed from the soil and fixed in the vegetation. Generally speaking C, N, the C/N ratio, and the humic substances capable of precipitation all increase, but pass through a slight maximum in (3). The C/N ratio sometimes shows a relative minimum in the H_{1-2} layers; the frequent occurrence of a relative maximum in the H_{3-4} layers is probably connected with intense activity of termites in these layers. The increase of humic substances is most marked in the H_{1-2} layers.

4273. GÉRARD, P. Étude écologique de la forêt dense a *Gilbertiodendron dewevrei* dans la région de l'Uele. **[An ecological study of the *G. dewevrei***

forest in the Uele region.] *Publ. Inst. Nat. Étude Agron. Congo Belge* (*Sér. sci.*) No. 87, 1960. pp. 159 + 24 photos. 42 refs. [F.]

Covers the soils, climate and general vegetation of the area; distribution of *G. dewevrei*; floristic composition, soils, and microclimate of the forest; succession; and silvicultural characters of *G. dewevrei*.

4274. WOOD, G. H. S. **A study of the plant ecology of Busoga District, Uganda Protectorate.** *Inst. Pap. Imp. For. Inst., Oxf.* No. 35, 1960. pp. 69 + 8 photos. 30 refs. Price 12*s*. 6*d*.

The following types are distinguished: forest, savanna, grassland, and freshwater communities. Undisturbed parts of the forest and savanna regions are accepted as climatic climaxes in the strict sense. Comparison is made with the vegetation zones of Nigeria. The absence of trees in swamp communities is ascribed to the physiological drought of such sites, and to the fact that the effective rooting depth only permits the growth of hygrophilous herbs.

4275. SHARMAN, C. **A preliminary report on the vegetation of the Horseshoe I.C.A.** *Rhod. agric. J.* 57 (6), 1960 (464–71 + 2 maps). 15 refs. E.M.B.

With a view to estimating the agricultural potentialities of this area of S. Rhodesia, a soil map is presented with an accompanying vegetation map, and brief descriptions are given of 8 different vegetation types (mainly woodland) with a list of identified species.

4276. RATTRAY, J. M. **The grass cover of Africa.** *FAO Agric. Stud.* No. 49, 1960. pp. 168 + map.

The map (scale 1/10,000,000) shows 48 grass associations, distinguished by 23 genera, which are described in some detail in the text. The study covers the whole of Africa.

4277. BIRD, R. D. **Ecology of the Aspen parkland of Western Canada in relation to land use.** *Publ. Dep. Agric. Can.* No. 1066, 1961. pp. x + 155 + 3 maps. 200 refs. Price $3.00.

An account of the original conditions, and changes in plant and animal ecology that have taken place since white settlement of the Prairie Provinces, as a result of hunting, fire, cultivation etc. The Aspen parkland lies between the great plains and the boreal forest; the land is in many places poorly drained and covered with small bodies of water; on the drier parts grassland and Aspen-dominated forest are intermixed.

4278. GRANDTNER, M. M. La forêt de Beauséjour, Comté de Lévis, Québec: étude phytosociologique. **[The forest of Beauséjour, Comté de Lévis, Quebec; a plant-sociological study.]** *Contr. Fonds Rech. For. Univ. Laval* No. 7, 1960. pp. 62 + 7 tbls., 1 map. 26 refs. [F.f.e.g.]

The vegetation types described include the Black Spruce swamp (*Sphagno-Piceetum*), White-Cedar bog (*Acereto-Thujetum*), boreal Poplar association (*Populetum boreale*), Aspen association (*Populetum tremuloides*), Red Maple association (*Aceretum rubri*) and Sugar Maple association (*Aceretum sacchari laurentianum*).

4279. BAKUZIS, E. V. **Structural organization of forest ecosystems.** *Repr.* from *Proc. Minn. Acad. Sci.* 27, 1959 (97–103). 12 refs.

An account of studies on the analysis of 356 Minnesota forest communities, using climatic and edaphic synecological co-ordinates. [Cf. *F.A.* 21 Nos. 298, 4137.]

4280. BAKUZIS, E. V., DUNCAN, D. P., and HANSEN, H. L. **Application of the methods of synecological co-ordinates in a study of forest geographical subdivisions of Minnesota.** *Minn. For. Note* No. 99, 1960. pp. 2. 1 ref. [Cf. *F.A.* 21 Nos. 4137–8.]

4281. BAKUZIS, E. V., DUNCAN, D. P., and HANSEN, H. L. **Cover relationships in Minnesota forest communities.** *Minn. For. Note* No. 100, 1960. pp. 2.

Presents diagrams using synecological coordinates, to show the mean density % of tree, shrub, ground and reproduction cover at different bivariate combinations of the relative community requirements for moisture, nutrients, heat and light in Minnesota forests. [Cf. *F.A.* 21 No. 298.]

4282. BAKUZIS, E. V., HANSEN, H. L., and DUNCAN, D. P. **Some characteristics of geographical and synecological distribution of Balsam Fir (*Abies balsamea* (L.) Mill.) in Minnesota.** *Minn. For. Note* No. 101, 1960. pp. 2. 3 refs.

From an analysis of 356 forest communities in Minnesota, the distribution of Balsam Fir in synecological co-ordinates (moisture, heat, nutrients, and light) is shown. [Cf. *F.A.* 21 Nos. 1531, 4137.]

4283. AUBRÉVILLE, A. Étude écologique des principales formations végétales du Brésil et contribution à la connaissance des forêts de l'Amazonie brésilienne. **[An ecological study of the principal vegetation types of Brazil and a contribution to knowledge of the forests of Brazilian Amazonia.]** Centre Technique Forestier Tropical, Nogent-sur-Marne. 1961. pp. 268 + 102 photos, 6 dgms., 6 maps. 152 refs. [F.]

Gives a detailed account of vegetation types by regions, a study of the ecoclimates of Brazil, and short sections on the general degradation of forests outside the Amazon basin, and the exploitation of the Amazonian forests. There is an annexe by *W. A. Rodrigues* on "Phytosociological aspects of the pseudo-catingas and flood-land forest of Rio Negro".

4284. HUECK, K. Mapa de vegetación de la República de Venezuela. **[Vegetation map of Venezuela.]** *Bol. Inst. For. Latino Amer., Mérida* No. 7, 1960 (3–15 + 1 map). [Span.e.]

Presents a map based on information collected by botanists and foresters over the last two centuries, with brief notes on the main vegetation types and climatic diagrams.

4285. BURGESS, P. F. **The structure and composition of lowland tropical rain forest in North Borneo.** *Malay. Forester* 24 (1), 1961 (66–80). 2 refs.

This paper presents a study of the structure and composition of natural forests in Gum Gum F.R., Lungmanis F.R., and Kalumpang F.R., the first two occurring on tertiary sedimentary rock and the last on basaltic lava. The method follows that of Richards (1957), the sample unit being a transect of 200 × 25 ft. A profile diagram, crown dimension data and lists of species by canopy storey are given for the forest in each study area. *Author's summary.*

4286. RYLEY, T. P. **The timber resources of North Queensland.** *Aust. Timb. J.* 26 (11), 1960 (55–60).

A paper read before the Australian Timber Industry Stabilizing Conference 1960, containing notes on the location, composition and climate of the forest types, an assessment of resources, and principles followed in rain-forest management.

4287. **Field trips, [of Australian Timber Industry Stabilising Conference 1960].** *Aust. Timb. J.* 26 (11), 1960 (94 . . . 116).

An illustrated account of the growth and silviculture of the rain forest of the Smithfield Reserve, 20 miles from Cairns, Queensland.

2. SILVICULTURE

See also Nos. 4262, 4270, 4286–7, 5295.

4288. RYLE, G. **New trends in silviculture of conifers consequent upon manufacturing developments.** *Scot. For.* 15 (2), 1961 (72–9).

Deals in some detail with changes in policy, particularly in regard to pruning and thinning, and stresses the need for adequate yield tables for the principal coniferous species grown in Great Britain.

4289. LALLEMAND, P., LEONARD, J. P., and MARTIN, J. La sylviculture moderne du pin maritime dans les landes de Gascogne. **[Modern silviculture and management of *Pinus pinaster* in the Landes of Gascony.]** *Bulletin Technique d'Information des Ingénieurs des Services Agricoles, Paris* No. 150, 1960 (345–60). [F.] A.P.B.

Describes methods of establishment and tending, and discusses thinning, resin tapping, the development of stands by stem number, diameter, volume etc., and financial yield. Assuming an interest rate of 5% on capital invested, clear felling at 50 years, after 6 years' tapping to death, is recommended.

4290. PAVLOV, P. V. Saval'skoe lesničestvo. **[The Savala forest district.]** *Trudy Vsesojuznogo Instituta Zaščity Rastenij, Leningrad* No. 15, 1960 (13–32). 4 refs. [Russ.] B.A.P.

In this district, lying on the boundary of the steppe and forest-steppe zones, in the Voronezh region, the plantations date from ca. 1870. A review is given of the soils, natural vegetation, history of plantation establishment, and silvicultural characteristics of the stands, and the following conclusions are drawn: acorns of late-flushing Oak are better than those of early-flushers; dense direct sowings of acorns in closely spaced rows give good results, but cleanings and thinnings should begin earlier; on sandy soils, Scots Pine should be planted with hardwoods, viz. Oak on sites with a high or medium humus content, and Birch on sands low in humus; when creating Pine/Birch or pure Birch plantations, some shade-bearing trees (e.g. Lime) or shrubs should also be introduced; Elm is not a good associate for Pine; Poplar plantations should be given a dense shrub layer; strips of hardwoods 20–30 m. broad around Pine stands have proved valuable against fires.

4291. **Proceedings of All India Teak study tour and symposium, December 1957–January 1958.** Forest Research Institute, Dehra Dun. 1959. pp. 196.

[Cf. *F.A.* 20 No. 1633.] In addition to recommendations, includes the following papers: Silviculture and management of Teak forests of Madhya Pradesh (*K. P. Sagreiya*); Teak forests and their management in Bombay State (*J. A. Singh*); Teak in Mysore (*S. Hussein*); Teak forests and their management in Madras State (*E. S. Thangam*); Teak in Andhra Pradesh (*M. S. Khan*); Regeneration of Teak forests (*S. K. Seth* and *M. A. W. Khan*) [cf. *F.A.* 20 No. 343]; Teak soils (*S. K. Seth* and *S. P. Yadav*) [cf. *F.A.* 20 No. 2915]; Proposed programme for physiologico-ecological studies on Teak (*S. K. Seth*, *M. A. W. Khan*, and *A. C. Gupta*); Management of Teak forests under coppice system (*S. S. Shrivastava*); Teak in Northern and Central Bombay (*V. D. Mahendale*); A note on the occurrence and regeneration problems of Teak in Vidarbha (*S. S. Buit*); Teak in Bombay (*E. K. Kotwal*); Short history of the Korni Teak plantations (*G. Moni*); Teak in Andhra Pradesh (*V. S. J. Rao*); A note on "elite thinning" in Teak plantations in the Madras State (*V. S. Krishnaswamy*) [cf. *F.A.* 20 No. 1817]; Teak forests in Rajasthan (*C. M. Mathur*); Teak plantations of W. Bengal (*K. C. R. Choudhury*); The problem of Teak plantations in the Kurseong Forest division (*T. K. Mitra*); Regeneration of Teak in Burma (*U Maung Gale*); Teak planting along fringes of water-courses in delta areas (*M. Thyagarajan*); *Tectona grandis*: recent research trends at Nilambur (*C. Chandrasekharan*); Recent trends in thinning of Teak plantations in Nilambur (*P. N. Adiody*).

4292. WYATT-SMITH, J. **A review of Malayan silviculture to-day.** *Malay. Forester* 24 (1), 1961 (5–18). 16 refs.

Reviews some of the existing techniques, e.g. linear sampling of regeneration and big trees before logging, and girdling of uneconomic species after logging, and describes some suggested modifications. Also discusses some proposed pre-felling treatments of natural forest (cleaning, climber cutting etc.).

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 4023–4, 4634, 4917, 4947.

4293. FOURCHY, P. Sapin et sapinières des Alpes. Relativité en matière d'aménagement.

[Fir and Fir stands in the Alps. Relativity in the matter of management.] *Rev. for. franç.* 13 (4), 1961 (233–43). 7 refs. [F.]

Reviews the history of management of *Abies alba* in the French Alps, the attempts to treat it on a uniform system, and the defeat of such attempts by the extreme variability of regeneration in this species.

4294. PLOCHMANN, R. 150 Jahre Waldbau im Staatswaldgebiet zwischen Osser und Dreisessel. **[150 years of silviculture in the region of state forests between Osser and Dreisessel.]** *Forstwiss. Forsch.* No. 13, 1961. pp. 130. 102 refs. [G.]

A study of a region of mixed forests in the Bayerischer Wald range on the Czech border, which had remained largely untouched until put under management early in the 19th century. On the basis of management records and temporary sample plots, the silvicultural systems practiced successively, and their effect on species composition and structure on various sites, were investigated. Broadly speaking, the earliest system, primitive selection, favoured Silver Fir, the succeeding uniform system—Spruce, and the group system (Bavarian *Femelschlag*) then adopted—Beech (an undesirable development). For most sites an irregular shelterwood system (a system resembling the *Badischer Femelschlag*) is recommended.

4295. ROMANOV, A. P. Razrabotat′ sposob rubok glavnogo pol′zovanija dlja gornyh pihtovyh lesov Vostočnogo Kazahstana. **[Working out methods for principal fellings in the mountain *Abies* [*sibirica*] stands of E. Kazakhstan.]** *Lesn. Hoz.* 13 (11), 1960 (16–7). [Russ.]

The officially recommended method, viz. fellings removing 60–90% of the biggest and best trees and leaving the smallest and worst (irrespective of the state of the natural regeneration), has proved quite unsuitable. The best method, as experience shows, is to fell all Fir $\geqslant 24$ cm. d.b.h., all defective trees, and all hardwoods. This ensures good natural regeneration of Fir and the creation and maintenance of virtually pure stands.

4296. KÖSTLER, J. N. Die Lenzburger Waldpflege. Versuch einer Analyse des Deck'schen Waldbaustils. **[Forest management at Lenzburg. An attempt to analyse Deck's style of silviculture.]** *Forstwiss. Cbl.* 80 (3/4), 1961 (65–106). 29 refs. [G.]

An account of the history of this Swiss forest from 1796 to the present, with particular attention to the period of Deck's management (1914–56), and an analysis of the selection system he followed.

222. Coppice, Pollarding and Lopping Systems

See also Nos. 4299–4301, 4322.

4297. KOVAL′, I. P. Vozobnovlenie, rost i produktivnost′ nekotoryh tipov dubovyh i dubovyh-sosnovyh lesov severo-zapadnogo Kavkaza. **[Regeneration, growth and yield of some Oak and Oak/Pine forest types in the N.W. Caucasus.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (5–18). 11 refs. [Russ.]

A study covering stands of (*a*) Sessile Oak/Rhododendron, and (*b*) Sessile Oak/grasses, both with and without Scots Pine. In (*a*), natural regeneration under the canopy lives only $\leqslant$3–5 years; in (*b*), only $\leqslant$5–7 years. In (*a*), the height growth of the coppice Oak exceeds that of the Pine for as long as 30 years, in (*b*) for as long as 20 years. Pine improves the stand yield [see *F.A.* 22 No. 894]. On (*a*)-type sites, the best mixture is $\nless$60% Oak and $\ngtr$40% Pine; on (*b*)-type sites, 40% Oak and 60% Pine.

4298. KOZDON, P. Die Eichen auf der iberischen Halbinsel, ihre Vitalität und wirtschaftliche Bedeutung. **[The Oaks of the Iberian peninsula, their vitality and economic importance.]** *Holz-Zbl.* 87 (6), 1961 (65–6). 1 ref. [G.]

Describes stands of Oak coppice, consisting chiefly of *Quercus robur s.s.*, *Q. ilex*, *Q. toza*, and *Q. lusitanica*, and forming forest "oases" in wide expanses of maquis and garigue in many parts of the peninsula, which the author observed in the mountains near Toledo. These stands, though exploited for charcoal on a 12- to 14-year cycle, are dense and vigorous and have a striking capacity for vegetative reproduction, mainly from root suckers. This capacity, it is suggested, may explain their survival, despite the paucity of seed and its destruction by animals, where other, non-suckering species could not survive human abuse. It is also suggested that by allowing Oak coppice to grow into high forest under adequate tending plus some protection from goats and game, the forest area of the peninsula could be increased at less cost than by conifer plantings. Some small groups, left undisturbed, reached a height of 18 m. in 36 years, with frequent and copious mast.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also Nos. 4298, 4517.

4299. JOLAIN, R. Essai sur les taillis de chêne vert et de chêne pubescent. **[A study of *Quercus ilex* and *Q. pubescens* coppice.]** *Rev. for. franç.* 13 (2), 1961 (81–9). [F.]

A survey of the large areas of coppice of these species in France (ca. 200,000 ha.), yield, financial returns etc. Suggestions are made for enriching *Q. pubescens* coppice (which normally occupies the better sites) by interplanting with Austrian Pine and Cedar.

4300. HATT, P. Avenir proposé pour la forêt de la Harth. **[Future plans for the Harth forest.]** *Rev. for. franç.* 13 (2), 1961 (103–17). [F.]

Describes the measures that should be taken to convert this large extent of poor forest (largely Hornbeam), which has hitherto been managed as coppice-with-standards for the production of fuelwood. Parts are to be converted to *Pinus sylvestris* with understorey of hardwoods, parts to Oak high forest, and the rest gradually to mixed hardwoods.

4301. ROGER, G. Problèmes posés par la gestion des hêtraies ariégeoises. **[Problems presented by the management of the Beechwoods of Ariège.]** *Ann. Éc.*

Eaux For., Nancy 17 (4), 1960 (451–95 + 2 maps). [F.f.e.g.span.]

Explains the policy being pursued in the State forest of Foix, where the establishment of a pulp mill has provided an outlet for thinnings, and the decline in the rural population has reduced the former demand for fuelwood. It is proposed to exploit the Beech while converting the forest to conifers.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 4206, 4243, 4285, 4297–8, 4305, 4337, 4368–9, 4466, 4491, 4917, 4921–2.

4302. BERKLUND, B. L. **Handling tree status.** *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (43–9).

Suggests two possible tree-status codes, related to volume potential, for facilitating the division of forest inventory components into suitable categories. The identification of trees by these codes is particularly useful for the preparation of cumulative summaries showing net growth (defined, with formula) and volume change by species for entire forests or for districts, using punched cards.

4303. BICKERSTAFF, A., and MATTE, L. **The combined stocking of multiple species combinations.** *For. Chron.* 37 (1), 1961 (35–8). 2 refs.

The combined stocking for n species whose individual composite stockings are S_1, S_2 . . . S_n, expressed as decimal fractions, is equivalent to: $1-(1-S_1)\ (1-S_2)\ .\ .\ .\ (1-S_n)$. The derivation and application of the formula in stocked quadrat regeneration surveys are described. *Authors' summary.*

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 3983, 4220, 4635, 4696, 4871–2, 4921.

4304. LI, W.-H., and HSÜ, C.-P. O vozobnovlenii eli v nekotoryh tipah elovyh lesov južnoj tajgi Evropejskoj časti SSSR. **[Regeneration of *Picea abies* in some Spruce forest types of the southern taiga in European Russia.]** *Bot. Ž.* 46 (2), 1961 (279–86). 9 refs. [Russ.]

An account of natural regeneration of Spruce (density, distribution in relation to micro-relief, age structure, and growth rate), mainly in the *Piceetum myrtillosum* and the *P. oxalidoso-dryopteridosum*, but also under broadleaved stands appearing on clear-felled areas in Spruce forest, e.g. Birch/*Calamagrostis*/*Vaccinium myrtillus*, and Birch/*Dryopteris*/*Setaria* stands.

4305. JOHANSSON, A. Studier av uppkomst och utveckling av några barrblandbestånd i mellersta Värmland. **[The natural establishment and development of some mixed conifer stands in central Värmland.]** *Svenska SkogsvFören. Tidskr.* 59 (1), 1961 (23–49). 5 refs. [Sw.sw.]

A study was made of 4 good-quality middle-aged stands of evenly mixed Spruce and Pine, based on increment borings at various heights on 50 trees in each stand. Nearly all the Spruce were older than the Pine and had reached a height of 50 cm. when the Pines were only 8 cm. high. The Pines generally did not catch up until 3–5 m. tall but, in all 4 stands, present mean heights of the two species were practically the same. Hardly any Spruce had had a Pine within a radius of 3 m. in the early stages. Only in one stand was there a significant correlation between the ranking in height at the time when all Spruce had reached 8 cm. and their present ranking. The findings suggest that mixed stands might be established if Spruce advance reproduction were left when preparing sites for regeneration (natural or artificial) of Pine, and that Pine could be used to advantage in supplementing sparse natural or artificial regeneration of Spruce.

4306. Çamkoru Araştırma Ormanında çam (*Pinus silvestris* L.) meşcerelerinde serbest silvikültür metodunun tatbiki ve bunun meşcerenin ilerdeki gelişimine tesirlerinin arastırılması. **[Adaptation of modern silvicultural methods to *P. sylvestris* stands in the Çamkoru Research Forest and research on their effect on the future improvement of the stand.]** *Extr.* from *Orm. Araşt. Enst. Yıl. Bült.* No. 8, 1959 (14–6, 55–6). [Turk.e.*e.*]

Tabulated results are given showing the number of 1- and 2-year seedlings, and mortality, on fenced or unfenced plots, on mineral soil or dry raw humus, with or without soil cultivation in Aug. and Nov. 1959 after opening to improve the light régime, in 'compaction age' [even-aged?] Pine.

4307. PAMAY, B. Türkiye'de sarıçam (*P. silvestris* L.) ın Tabiî gençleşmesi üzerine araştırmalar. **[Natural regeneration of *Pinus sylvestris* in Turkey.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (2), 1960 (37–67). 71 refs. [Turk.F.]

Discusses area, importance, ecology, etc. of Scots Pine in Turkey. The different types of natural regeneration of Scots Pine in pure and mixed natural forests are described, and factors affecting natural regeneration, e.g. competition, soils, aspect, light, etc., are discussed. Lists are given of the most suitable silvicultural methods for ensuring natural regeneration in pure and mixed stands.

4308. REJMERS, N. F. Oblesenie garej i lesnyh massivov, uničtožennyh šelkoprjadom, v gornoj kedrovoj tajge juga Pribajkal'ja i rol' pozvonočnyh životnyh v ètom processe. **[Regeneration of burns and of forests destroyed by *Dendrolimus sibiricus* in the mountain *Pinus sibirica* forests of the south Cis-Baikal area, and the role of vertebrates in this process.]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody (Otd. Biol.)* 63 (4), 1958 (49–56). 12 refs. [Russ.e.] C.G.B.

Investigations in these forests were made in the *Cembretum hylocomiosum* and *C. bergeniosum*. In unburnt stands killed by *D. sibiricus*, forest regeneration proceeds successfully, and no human assistance is required. The adverse effect of vertebrates on *P. sibirica* regeneration is less than the good done by *Nucifraga caryocatactes* in seed dispersal. On burns and in stands killed by *D. sibiricus*, fires are usual and often repeated, and to ensure natural regeneration, fire control measures must be instituted.

4309. KLINCOV, A. P. Ob ognevoj očistke lesosek kak mere sodejstvija estestvennomu vozobnovleniju lesa na Sahaline. **[Cleaning felling areas by burning, as a way of assisting natural regeneration of forest on Sakhalin.]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (160–1). 1 ref. [Russ.]

The temperature, moisture content, and nutrient status of the ash and soil were determined on patches where the slash had been burned on clear-fellings in Spruce and Larch/Spruce forests of the *hylocomiosum* type. It was found that, contrary to some reports, these patches do not provide good conditions for natural regeneration, and they should be scarified or the ash partly removed.

4310. JAMES, G. A., and GREGORY, R. A. **Natural stocking of mile-square clear cutting in southeast Alaska.** *Sta. Pap. Alaska For. Res. Cent.* No. 12, 1959. pp. 9. 3 refs.

Concludes, from a study of seed dispersal distance and development of reproduction in an approximately square 700-acre clear-felled area in a typical old-growth stand (ca. 76% *Tsuga heterophylla*, 20% *Picea sitchensis*, and 2% each of *Thuja plicata* and *Chamaecyparis nootkatensis*) in the Maybeso Experimental Forest, that this area is too large to ensure sufficient reproduction. Though initial stocking was adequate, subsequent mortality and the likelihood of periods of light seed-years indicate that the present rule of thumb that no part of a cutting should be >20 chains from a seed source should be continued.

4311. MACLEAN, D. W. **Some aspects of the Aspen-Birch-Spruce-Fir type in Ontario.** *Tech. Note For. Br. Can.* No. 94, 1960. pp. 24. 26 refs.

This type, which can grow on almost any site, is typically a fire climax. In stands originating after fire, Spruce [*Picea mariana* and *P. glauca*] form 90% of the coniferous element, but on cut-over land only 16%. Recommendations are made for silvicultural measures to increase the proportion of Spruce and encourage its regeneration (notably by soil scarification) and to improve the quality of Fir (*Abies balsamea*) by felling stands before they become overmature.

4312. **Engelmann Spruce regeneration.** *Extr.* from *Rep. Intermt. For. Range Exp. Sta. 1960*, 1961 (5–6).

Trials of several treatments on clear-felled strips indicate that the best means of obtaining prompt natural regeneration of *Picea engelmannii* is to scarify ⩾50% of the area by bulldozer. If the site is too steep for this, prescribed burning is far superior to no treatment at all.

4313. SMITH, L. F. **Tree percent on burned and unburned Longleaf seedbeds.** *J. For.* 59 (3), 1961 (201–3). 6 refs.

Establishment of *Pinus palustris* seedlings was studied on (*a*) plots burned before seed-fall to eliminate ground cover and (*b*) unburned control plots, in 6 stands in S. Mississippi. Stocking after 1½ years was much superior on (*a*) (2467 seedlings/acre vs. 800 for (*b*)). Details are given of the sampling technique used and the distribution of seed and seedlings. [Cf. *F.A.* 11 No. 2643.]

4314. LLOYD, R. C. **Growth study of regenerated Kauri and Podocarps in Russell Forest.** *N.Z. J. For.* 8 (2), 1960 (355–61).

Describes and discusses the results of a stem analysis of all species on a typical area of regenerated *Agathis australis/Dacrydium cupressinum/Phyllocladus trichomanoides* forest fostered under a Kanuka (*Leptospermum ericoides*) nurse. Kanuka was found to be a very effective nurse, and the stand was all-aged. The regeneration period for this type of stand is shown to be 60–80 years. The younger age-classes are suppressed, and the stand is tending to become all-aged in appearance.

4315. CAMERON, R. J. **Natural regeneration of Podocarps in the forests of the Whirinaki River Valley.** *N.Z. J. For.* 8 (2), 1960 (337–54). 1 ref.

Early in the 19th century, Maori tribes cleared and cultivated several small areas in dense Podocarp (*Podocarpus ferrugineus*, *P. spicatus*, *P. totara*, *P. dacrydioides*) forest in this valley. They were abandoned ca. 1840 and today carry a seral vegetation of dense pole Podocarps. Studies made in these and in younger areas of natural Podocarp regeneration indicate the results that could be expected from any attempt to regenerate the forest using methods of group or strip felling. *From author's summary.*

4316. BURSCHEL, P. Untersuchungen über die natürliche Verjüngung der Buche. **[Natural regeneration of Beech.]** *Allg. Forstzeitschr.* 16 (6), 1961 (108–13). 16 refs. [G.]

Describes observations on seed production, seed fall, seed-quality, and germination, and seedling survival in 3 stands aged 120–160 years near Hann. Münden after a moderate mast in 1958. Of two soil treatments applied, hoeing (*a*) proved greatly superior to chemical weeding (*b*) (10 kg. dalapon + 3 kg. Tormona/ha., timed to exclude phytotoxic after-effects), in both germination and survival, but even with (*a*), only in one stand was regeneration adequate, largely owing to late frosts and drought in 1959. Here, germination and survival on (*b*) were lower than on untreated controls (*c*). On the other two sites, germination was lowest on (*c*) and survival lowest on (*b*).

4317. RYŽKOVA, V. N. Estestvennoe vozobnovlenie pod pologom lesa v dubravah lesostepi. **[Natural regeneration under canopy in Oak stands of the forest-steppe zone in Russia.]** *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (58–61 + 1 tbl.). 12 refs. [Russ.]

In the centre of the zone, on moist and fresh dark-grey and grey forest soils, natural regeneration is quite practicable with proper silviculture. In the more southerly parts, in fresh areas, natural regeneration should be assisted by soil cultivation on 3000 patches per ha.; in dry and very dry areas, sowing or planting will be necessary. In the N. parts of the zone, because of the rare seed-years, it is advisable to prepare 2500–3000 patches per ha. to assist natural regeneration after regeneration fellings.

4318. Marquis, D. A., and Bjorkbom, J. C. **How much scarification from summer logging?** *For. Res. Note Ntheast. For. Exp. Sta.* No. 110, 1960. pp. 3.

The amount and pattern of soil disturbance caused by logging was studied on 8 areas of ⅔ acre each in an old-growth hardwood stand in the Bartlett Experimental Forest, N.H. Merchantable material was skidded tree-length, using an HD-5 tractor and arch; all other trees down to 2 in. d.b.h. were cut and left on the ground. Only 32% of the total area was disturbed sufficiently to provide a favourable seedbed for Birch. This consisted of exposed mineral soil (9%) and humus (23%), concentrated on the skid routes and therefore poorly distributed. Heavy slash, in piles ≥4 ft. high on the undisturbed areas, covered 13% of the total area. If regeneration of Birch is the object, a proportion much larger than ⅓ of the logged area should be scarified.

4319. Hawkins, P. J. **Establishment of regeneration of Narrow-leaf Ironbark (*Eucalyptus crebra*) by top burning following logging.** In *Res. Note Qd. For. Serv.* No. 7, 1958. pp. 18. 5 refs. Limited distribution.

In mixed stands of *E. crebra* and *Callitris glauca*, fire exclusion is resulting in an increase in the proportion of the latter. Following observation of profuse *E. crebra* regeneration near tops burnt after logging, experiments were made to encourage regeneration by burning individual tree crowns after felling. Results showed that this method could not be relied on to regenerate *E. crebra* stands, and that, where seed is available, lack of regeneration can usually be correlated with lack of rain in the immediate post-germination period; the majority of seedlings die within 2–3 weeks after germination. Protection from the sun during the early stages is essential for seedling survival. Some data are given on the flowering and fruiting cycle of *E. crebra*.

4320. Frankcombe, D. W. **Logging for regrowth.** *APPITA, Melbourne* 14 (5), 1961 (179–84). 5 refs.

Recent changes in forest practices introduced by Australian Newsprint Mills Ltd. on its 330,000-acre concession in S. Tasmania are discussed. Logging and silvicultural pursuits have been integrated, in the interests of sustained-yield management. The broad requirements for the successful regeneration of the Ash group of Eucalypts in S. Tasmania are summarized. *Author's summary.*

4321. Noort, A. C. van. **The development of Jarrah regeneration.** *Bull. For. Dep. W. Aust.* No. 65, 1960. pp. 12. 2 refs.

Presents preliminary results of some planting trials with *Eucalyptus marginata* established in 1958. It was found that, while initial responses to compost applications were obtained, the rate of development was reduced by a droughty summer. Recent observations indicate that successful regeneration depends on the presence of well developed lignotuberous advance growth at the time of logging.

4322. Milescu, I., and Armăşescu, S. Unele particularităţi dendrometrice ale arboretelor de salcîm în raport cu provenienţa. **[Some characteristics of the yield and increment of *Robinia pseudoacacia* in relation to their origin.]** *Rev. Pădurilor* 75 (7), 1960 (414–7). [Rum.russ.g.e.f.]

Gives tabulated data on height, quality class, d.b.h., volume, volume m.a.i., wood density, % of sawlogs, % of dieback, and % decay and other defects, in trees (*a*) planted from seedling origin, (*b*), (*c*), and (*d*) of 1st, 2nd, and 3rd generations of coppice respectively. In a few cases (*b*) showed slightly higher d.b.h. values than (*a*), but in other respects was slightly inferior; (*c*) and (*d*) were markedly inferior in every respect, (*d*) being considerably inferior to (*c*). It is concluded that in no circumstances should coppice regeneration be permitted beyond the second generation.

4323. Enescu, V. Influenţa provenienţei (sămînţă, lăstari, drajoni) şi a vîrstei asupra sistemului de înrădăcinare al salcîmului. **[The influence of origin (seed, coppice shoots, root suckers) and age, on the root system of *Robinia pseudoacacia*.]** *Rev. Pădurilor* 75 (7), 1960 (396–9). 10 refs. [Rum.russ.g.e.f.]

Describes, from the author's own observations and from the literature, the different forms of root system in Robinia trees derived from different forms of regeneration. Best results are obtained by planting stock of seedling origin, except on sandy soils, where stock derived from root suckers does best. Stock of coppice origin is inferior to both the others.

4324. Barykina, R. P. Osobennosti obrazovanija kornevyh otpryskov u beloj akacii (*Robinia pseudoacacia* L.). **[Features of the formation of suckers in *R. pseudoacacia*.]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody* (*Otd. Biol.*) 63 (4), 1958 (57–71). 18 refs. [Russ.russ.e.] C.G.B.

Describes, on the basis of work in the Kamyshin region, the root system of cuttings, seedlings, and older trees; the formation and growth of suckers; and the anatomy of the roots, and of the buds that develop into suckers. Damage to the above-ground part of the plant, or exposure of and damage to the root system, increase sucker production, a feature making it useful in erosion-control planting. The adventitious buds form in the parenchyma of the secondary bark on horizontal roots (1·5–2·5 mm. diam.) when the plant is 4–5 years old, and usually develop into suckers 2–3 years later.

4325. Guščin, I. I. Nekotorye dannye o vozniknovenii i otpade poroslevyh rastenij osiny. **[Some data on the production and mortality of Aspen suckers.]** *Lesn. Ž., Arhangel'sk* 2 (5), 1959 (35–7). [Russ.]

Studies were made after winter clear-felling of an Aspen stand with some Spruce and Birch, in the Moscow region. The Aspen were >55 years old, the density 0·8, and the site class I. In the first year after felling, >2·6 million suckers appeared per ha.; 62·2% died in the first year but, in the fourth year after felling, some 569,000 suckers (22·6%) were still alive. No mortality occurred among suckers appearing before May 5th. [Cf. *F.A.* 22 No. 348.]

232. Artificial Regeneration

4326. Forstkulturen. **[Forest plantations.]** *Allg. Forstzeitschr.* 16 (9), 1961 (155–82). 18 refs. [G.]

A special number, including articles on: Piece-rate fixing for angle-planting (*F. Geiger*) [cf. *F.A.* 19 No. 4143]; Work organization in the tending of young growth (*A. Schleyer*); Extending dormancy in nursery plants through cooling (*M. Ostermann*) [cf. *F.A.* 22 No. 1779]; Work organization in plantations [a survey of 1959 and 1960 literature in German including regeneration, nurseries, etc.]; and Successful sowings through soil disinfestation (*F. Riecke*) [describing how treatment, in October, of an exhausted nursery soil with 100 c.c./sq. m. of Trapex, a methylisothiocyanate preparation, resulted in destruction of weeds and plant-feeding nematodes, and better survival %, height growth and vigour of Pine seedlings sown in May].

4327. Minckwitz, H. von. Einführung der künstlichen Bestandesbegründung im Thüringischen Schiefergebirge. **[The introduction of artificial regeneration into the Thuringian Schiefergebirge.]** *Arch. Forstw.* 10 (1), 1961 (94–108). 47 refs. [G.g. russ.e.]

[Cf. *F.A.* 19 No. 1774.] A trial of broadcast sowing is cited from as far back as 1719, but sowing (line and spot) was not common until after 1790, nor planting (pit planting, balled stock planting) until after 1800. Seed was collected from suitable stands, the forest administration operating its own drying kilns from 1773. The seed trade, developed soon after, did not extend beyond these mountains, so that purely local provenances are postulated for the seed used. The reforestation of grossly overfelled areas resulted in a continually changing forest, with Spruce and Pine replacing Silver Fir and Beech. A report of 1854 refers to "Spruce mania", then 30 years old, provoking dire retribution in the form of glaze damage and bark insect attack.

4328. Istomin, L. A. Opyt sozdanija lesnyh kul′tur po uproščennoj agrotehnike v Udmurtskoj ASSR. **[Trials in creating forest plantations by a simplified technique in the Udmurt ASSR.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (53–63). 5 refs. [Russ.]

The technique is to sow or plant Scots Pine and/or Norway Spruce on clear-felled areas, without any stump-grubbing, preparatory tillage, tending (or only the barest minimum), or beating-up. The technique aims at cheap artificial regeneration without mechanization, on areas where clear felling has been mechanized. The number of seedlings planted, or the number of seed-spots used, should be 25–30% greater than in normal plantations. The results of some trials are tabulated. Preliminary indications are that the technique is much cheaper than normal plantation technique and gives satisfactory results.

4329. Ogievskij, V. V. Nazrevšie voprosy iskusstvennogo lesorazvedenija v južnoj časti Sibiri. **[Urgent problems of artificial regeneration in southern Siberia.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (43–9). 11 refs. [Russ.]

The need for artificial regeneration is urgent, owing to the increasing area of fellings in S. Siberia, the failure of natural regeneration of desirable species on much of this area, and the inability of some regions even now to meet their wood requirements from their own forests. The performance of Scots Pine plantations ⩽46 years old on various sites in the Krasnoyarsk and Kemerovo districts is shown in tables. The figures show that, on the deep sod-podzolic clay-loams, the grey, dark-grey, and cinnamon-brown forest soils, the podzolized chernozems, the solods, and the deep skeletal soils on slopes, yields equal those on site classes I–Ia, while on shallow sod-podzolic clay loams, shallow humus-carbonate soils, and ordinary chernozems, yields equal those of site class II. Less information is available on the performance of Siberian Larch plantations in the area, but the indications are that they are as good as, or better than, Scots Pine plantations, except on poor sandy soils. The necessity for rapid development of suitable plantation techniques for S. Siberia is urged.

4330. Tryon, E. H., Carvell, K. L., and Berthy, H. P. **Planting coniferous forests in West Virginia.** *Circ. W. Va. Agric. Exp. Sta.* No. 109, 1960. pp. 50.

Advice on choice of species, planting methods, tending etc.

4331. Silva, H. Lains e. Regeneração do coberto vegetal da Guiné Portuguesa. **[Regeneration of the vegetation of Portuguese Guinea.]** *Estudos Agronómicos Missão de Estudos Agrónomicos do Ultramar, Lisboa* 1 (2), 1960 (103–24). 26 refs. [Port.port.e.]

Problems involved in the regeneration of the forests of Portuguese Guinea are discussed. Returns from exploiting marketable species in the climax forests of the highlands are low, and costs are high. Little success has been obtained with pure plantations of e.g. *Khaya senegalensis*. The author considers the possibility of regenerating the forests, not only with species that are timber producers, but also with those yielding minor forest products. A list with short notes is given of suitable native species, producers of forage, fruit, oils, fibres, medicinal products, gums and resins. Some suitable exotics are also considered. A programme of research necessary for the successful establishment and exploitation of such species is outlined.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 4187–9, 4459–60, 4466, 4523–6.

4332. Champion, Sir H., and Brasnett, N. V. **Choice of tree species.** *FAO For. Developm. Pap.* No. 13, 1958 [1960]. pp. 307. 240 refs. Price $3.50 or 17*s*. 6*d*.

This section of the *World Forest Planting Manual* deals with the principles and factors that should guide the choice of tree species for planting on various sites. The authors, drawing on their experience in many parts of the world, have included a number of examples of specific sites and the results of introduction of certain species on those sites. The publication is divided into: Part 1, *General*: (*i*) The planting site; (*ii*) Objects of the plantation; (*iii*) Possible exotics for trial; (*iv*) Use of mixtures, permanent and temporary; (*v*) Production data; (*vi*) Plantation techniques as affecting choice; (*vii*) Costs of planting; (*viii*) Effect of plantations on the site; (*ix*) Regeneration for further crops; (*x*) Experimental work. Part 2, *Ecological principles:* (*i*) General relations between climate and vegetation; (*ii*) Classification of the major vegetation types of the world; (*iii*) Relation between topography, soil and vegetation; (*iv*) Floristic considerations; (*v*) Regional climates and vegetation; (*vi*) Application to representative sites; (*vii*) Tropical lowland climates; (*viii*) Tropical highland climates; (*ix*) Temperate and subtropical climates. Part 3, *Selected species: Picea abies, Pinus radiata, Tectona grandis*, and *Eucalyptus globulus*.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 4264, 4331, 4950.

4333. DIMITRI, M. J. Consideraciones sobre los árboles forestales exóticos cultivados en la Argentina. **[Exotic forest trees cultivated in Argentina.]** *Idia* No. 156, 1960 (15–36). 35 refs. [Span.] C.G.B.

Describes briefly the climatic regions of Argentina, recommending exotic species suitable for each, and presents a list, in systematic order of families, of the exotic forest species now cultivated in Argentina, showing their country of origin, suitable regions of cultivation in Argentina, rating of their performance and an estimate of their present abundance.

4334. AVRORIN, N. A. Introdukcija rastenij v Kanadskoj subarktike. **[Introduction of plants into the Canadian subarctic.]** *Bot. Ž.* 45 (7), 1960 (1086–95). 15 refs. [Russ.]

A conflation of information from Canadian sources on the introduction of trees and shrubs, and other perennial and annual plants into the subarctic, with comparisons from Soviet experience.

4335. MELEHOV, I. S. O vybore drevesnyh porod dlja oblesenija koncentrirovannyh vyrubok v taežnoj zone. **[Choice of tree species for reforesting concentrated clear fellings in the taiga zone.]** *Vestn. sel'.-hoz. Nauki, Moskva* 5 (8), 1960 (111–4). [Russ. e.g.f.] O.W.

A general discussion, pointing out, *inter alia*, that native taiga species should be the principal ones used, but that other species, e.g. *Larix sukaczewii*, *Picea glauca*, *P. sitchensis*, *Pinus contorta*, etc. should be tried as well.

4336. SOMMER, H. G. Anbau von Tannen-Arten in Grossbritannien. **[Planting *Abies* spp. in Great Britain.]** *Forstwiss. Cbl.* 80 (1/2), 1961 (49–62). 14 refs. [G.]

Discusses the history of planting, lists the species planted, gives an account of the performance of *A. alba*, *A. nobilis* and *A. grandis*, and presents brief notes on 8 other species.

4337. PONCELET, J. Le traitement des peuplements de mélèzes du Japon en Ardenne. **[The management of Japanese Larch stands in the Ardennes.]** *Bull. Soc. For. Belg.* 68 (3), 1961 (177–83). [F.]

A study of existing stands leads to the conclusion that *Larix leptolepis* will do well in this region provided that the green crown is ≮¼ of the total height in the first 30 years and at least ⅓ (preferably ½) at ca. 40 years. Dominants need a space equal to 20 times their d.b.h., i.e. with a d.b.h. of 12 cm. they should be spaced 2·4 m. apart.

4338. PHILIPPIS, A. DE. La culture des conifères dans l'étage du châtaignier en Italie. **[Conifer growing in the Chestnut zone of Italy.]** *Schweiz. Z. Forstw.* 112 (1), 1961 (27–42 + 1 plate). 10 refs. [F.g.]

A discussion of the species suitable for replacing the fast disappearing Chestnut, with special reference to experience gained in the extensive exotics trials, often now up to 40 years old, of the Silvicultural Research Station at Florence, including green Douglas Fir, *Pinus strobus*, *P. radiata*, *Larix leptolepis*, *Abies cephalonica*, *Cedrus atlantica*, *C. deodara*, *Chamaecyparis lawsoniana* and *Cupressus arizonica*. Climatic and soil requirements, regeneration, pests and diseases, etc. are discussed.

4339. TUSKÓ, L. Vörösfenyö fajtakísérlet elsö megfigyelései. **[First results of a Larch provenance trial.]** *Erdö* 9 (12), 1960 (457–61 + smries. in suppl.). [Hu.g.russ.]

Notes on 2-year plants of *L. decidua*, *L. decidua* var. *polonica*, *L. gmelinii*, and *L. sibirica* from the U.S.S.R. and Poland, and progeny of Hungarian plus-trees (*L. decidua*)—16 provenances in all. Four races of *L. d.* var. *polonica* are noteworthy as showing the best growth.

4340. CONSTANTINESCU, N., and BADEA, M. Importanţa duglasului albastru pentru cultura forestieră. **[The silvicultural importance of *Pseudotsuga taxifolia* var. *glauca*.]** *Rev. Pădurilor* 75 (7), 1960 (399–402). 7 refs. [Rum.russ.g.e.f.]

Discusses the increment of a stand of *P. taxifolia* var. *glauca*, established in mixture with *Pinus sylvestris* and *Picea abies* on a degraded chernozem soil that had previously carried a natural woodland of *Quercus* spp. The m.a.i. of the Douglas is 3·8 cu. m./ha., which is almost twice that of the Oak wood on this site. [Age of stand not stated, but apparently ca. 50 years.]

4341. HOLUBČÍK, M. Výsledky z pestovania zelenej douglasky *Pseudotsuga taxifolia* Britt. var. *viridis* a vejmutovky *Pinus strobus* L. na pokusných plochách školského polesia v Kysihýbli a na Kľaku. **[Results with *P.t.* var. *viridis* and *P. strobus* on experimental plots at Kysihýbel and Kľak.]** *Ved. Práce Výskum. Úst. Lesn. Hosp. Bansk. Štiav.* No. 1, 1960 (107–51). 15 refs. [Slovak.slovak.russ.g.]

P.t. var. *viridis* and *P. strobus* were grown pure.

and in mixture with each other and/or *Picea abies* and *Abies alba*, on plots established between 1884 and 1906. Inventories were made in 1957 and 1958, and full data on growth are given in tables and graphs. These show that pure *P.t.* var. *viridis* has a standing volume of 803 cu. m./ha. at 55 years—a volume not reached by *A. alba* (the best-yielding native conifer) until 80 years on its good site at Kl'ak. *P.t.* var. *viridis* outgrows *P. abies* in mixture with it, as does *P. strobus*. A *P. strobus*/*P. abies* stand had greater standing volume and c.a.i. than *A. alba* 10 years older on the Kl'ak site. In the last 10 years, however, the increment of *P.t.* var. *viridis* and *P. strobus* has slackened considerably.

4342. Holubčík, M. Sekvoja mamutia *Sequoia gigantea* (Lindl.) Decne. na Slovensku. **[*S. gigantea* in Slovakia.]** *Ved. Práce Výskum. Úst. Lesn. Hosp. Bansk. Štiav.* No. 1, 1960 (71–94). 15 refs. [Slovak. russ.g.]

[Cf. *F.A.* 21 No. 2977.] Gives notes and data, from a study in 1957, on the location and performance of the known specimens of *S. gigantea* in Slovakia, viz. 56 trees, 15–85 years old, on sites at 130–600 m. alt. Most of these are park trees, and only 9 are growing in the forest. At 83–85 years, mean d.b.h. is 88 cm., height 31 m., and volume >7 cu. m. The form factor is, on average, very low, viz. 0·35, because the trees are mostly open-grown. The biggest specimen has, at 80 years, a d.b.h. of 143 cm., a height of 29 m., and a volume of almost 16 cu. m.

4343. Slavkina, T. I. *Metasequoia glyptostroboides* Hu et Cheng v Botaničeskom sadu Akademii Nauk Uzbekskoj SSR. **[*M. glyptostroboides* in the botanical garden of the Uzbekistan Academy of Sciences.]** *Bot. Ž.* 46 (2), 1961 (236–41). 9 refs. [Russ.]

The species has been under observation at Tashkent since 1953, when seeds from China were grown in trials parallel to those in the Ukraine and Bashkiria [see *F.A.* 21 No. 1660]. At the end of the first growing season, seedlings raised in the open were 9–23 cm. tall. When transplanted at 2 years in the nursery, they did better in open, sunny spots (if regularly watered), than under shade. The first cone was observed on one tree in its 6th year, but the seeds were empty. Trees 7 years old attained heights up to 5 m. No pests or diseases have yet been observed, and the species has proved quite frost-hardy and resistant to low relative humidity, but very sensitive to soil moisture deficiencies.

4344. Leonidas, V. C. La adaptabilidad de coníferas exóticas a distintas condiciones ecológicas en Costa Rica. **[The adaptability of exotic conifers to various ecological conditions in Costa Rica.]** *Comun. cient. agric. Inst. Interamer. Cienc. Agríc., Turrialba* (*Dasonomía*) No. 14, 1960. pp. 3. 3 refs. [Span.]

Outlines the scope and aims of a trial which was to be started in Oct. 1960, involving planting eight different species of *Pinus* from Central America, and *P. halepensis*, on sites at 70, 610, 1300 and 2800 m. alt. in Costa Rica, and following their performance for a year. Various methods of mycorrhizal inoculation, and their effects, will also be studied.

4345. Cozzo, D. Informaciones sobre el crecimiento en la Argentina de varias especies del género *Pinus*. **[Information on the growth in Argentina of various species of the genus *Pinus*.]** *Rev. for. argent.* 5 (1), 1961 (3–20). 11 refs. [Span. span.e.]

Data have been collected from all work published to date on growth of *Pinus* spp. in Argentina, and with the addition of some original data collected by the author, a synthesis of information is presented on 32 artificial stands situated in the coastal and mesopotamian regions of Argentina. The species concerned are *Pinus caribaea*, *P. elliottii*, *P. halepensis*, *P. caribaea* subsp. *hondurensis*, *P. radiata* and *P. taeda*. Figures are given for age of stand, initial spacing, survival, mean diam. and height, present b.a., form factors, total volume/ha. and m.a.i. General observations are also offered on the behaviour of the species in Argentine conditions. *P. elliottii*, after an initial stage of slow development, grows extraordinarily quickly, attaining a m.a.i. of 30–40 cu. m./ha. on good sites and 20–25 cu. m./ha. even on poor sites. It is the chief coniferous species used in the coastal region of Argentina. *P. taeda* shows similar growth characteristics, but is more exacting. *P. radiata* has no initial slow-growth phase, but is less adaptable; it grows well for the first 5 years, but later falls off considerably, except on very favourable sites, where it attains a m.a.i. of 20 cu. m./ha. *P. halepensis* shows a m.a.i. of ca. 15 cu. m./ha. *P. caribaea* and *P. caribaea* subsp. *hondurensis* are of recent introduction into Argentina, and no definite conclusions as to their behaviour there can yet be drawn. The latter, however, after 2 years' growth in medium to good soil in Misiones (subtropical and humid climate) made extraordinarily rapid height growth, viz. 15 cm./month, a record for Pine of any species.

4346. Bannister, M. H., and Orman, H. R. ***Cupressus lusitanica* as a potential timber tree for New Zealand**. *N.Z. J. For.* 8 (2), 1960 (203–17). 14 refs.

Cupressus lusitanica may prove a useful addition to the exotic species used in New Zealand forestry. It appears to be rather exacting in its site requirements, and for this reason would probably lend itself to small plantations in some farming districts, rather than to extensive planting on the less fertile forest lands owned by the State. On good sites there is evidence that it is capable of producing ca. 200 cu. ft./acre/year with a 50-year rotation. Wood samples from three New Zealand sources were tested. Results from two shipments showed that the wood was, for most practical purposes, as strong as that of *C. macrocarpa*, although lighter. The third shipment, from trees that had been making more rapid radial growth than the others, included bands of compression wood and was relatively weak. A tentative conclusion from these tests is that the radial growth should preferably be at a rate giving

∢4 annual rings per inch. The wood has good seasoning, nailing, and finishing properties and should be quite suitable for general construction, joinery, interior finishing, and some types of furniture. *From authors' summary.*

4347. HENGST, E. *Quercus palustris*, eine amerikanische Roteiche zugleich Besprechung einer Ertragsprobefläche. [***Q. palustris*, an American Red Oak, with a discussion of a yield plot**.] *Arch. Forstw.* 10 (1), 1961 (1–16). 8 refs. [G.g.russ.e.]

[Cf. *F.A.* 19 No. 2786.] A detailed consideration of the yield and the silvicultural characteristics of the Pin Oak from data of a 100-year stand, near Dresden, growing in generally favourable conditions, measured and recorded from its 39th year. The m.a.i. was 4·5 cu. m./ha., culminating at 65 years with 8 cu. m. Productivity was almost the same as that of *Q. robur* and about one site-quality less than that of *Q. borealis*, the volume table of which was found applicable. Tree increment curves and the narrow dispersion of diameters indicate respectively tolerance to half-shade and to competition from other species. The best use of Pin Oak is in mixtures on soils where more valuable Oaks cannot grow, e.g. those liable to inundation.

4348. ČIRKOV, V. A. Cennaja drevesnaja poroda. [**A valuable tree species.**] *Priroda, Moskva* 50 (2), 1961 (107–8). [Russ.] A.P.B.

Describes the performance of *Maclura pomifera*, a good soil-stabilizing species, planted about 50 years ago near the edge of the Black Sea at Loo, in the Krasnodar region. It has a height of 8–12 m., a mean d.b.h. of 23 cm., and a dense root system, and is considered an excellent species to plant for coastal erosion control.

4349. AKIMOČKIN, N. G. Raznovidnosti lip v central′noj lesostepi. [**Species and varieties of *Tilia* in the central forest-steppe zone.**] *Lesn. Hoz.* 13 (11), 1960 (38–9). [Russ.]

Of the 19 species and varieties on trial in parks, arboreta or plantations at the Forest-Steppe Experiment Station in the Lipetsk region, on leached chernozem under drought conditions, *Tilia grandifolia*, *T. g.* var. *laciniata*, *T. amurensis* and *T. americana* have proved the most promising for protective afforestation and amenity planting. Others of promise are *T. cordata*, *T. pekinensis*, *T. mongolica*, *T. tomentosa*, *T. ledebourii*, *T. europaea*, *T. mandshurica*, *T. caucasica*, and *T. c.* var. *euchlora*.

4350. ASANOVA, V. K. Dzel′kva i perspektivy ee kul′tury. [***Zelkova*, and prospects for its cultivation [in the U.S.S.R.].**] *Lesn. Ž., Arhangel′sk* 3 (4), 1960 (158–9). [Russ.]

The two species found in the S.W. Transcaucasus are *Z. carpinifolia* and *Z. hyrcana*. Their biology and ecology are briefly described. Unsystematic fellings, grazing, and wholesale clearing to provide ground for subtropical crops (e.g. Citrus fruits) have seriously reduced the area and quality of *Zelkova*, so that artificial regeneration and rehabilitation of existing stands is urgent. Recent work on this in the Lenkoran region of Azerbaijan is cited, and the good performance of *Zelkova* in the Crimea, S. Ukraine and N. Caucasus pointed out.

4351. KHAN, A. A. **Mortality in certain species of *Eucalyptus* at Changa Manga Arboretum.** *Pakistan J. For.* 10 (3), 1960 (209–12). 1 ref.

E. astringens, *E. oleosa*, *E. polyanthemos* and *E. gomphocephala* are all dying back or dying at this arboretum. Investigations indicate that the trouble is due to high temperatures and not, as was at first thought, to excessive moisture. These species are unsuitable for trial in the plains of W. Pakistan where shade temperatures rise to ⩾100° F. in the summer.

4352. YACUBSON, D. Algunas consideraciones sobre los eucaliptos cultivados en América Latina. [**Eucalypts cultivated in Latin America.**] *Misc. for. Adm. Nac. Bosques, B. Aires* No. 1, 1960. pp. 4. 4 refs. [Span.]

Presents rough estimates of the total area planted in 13 Latin American countries and the species used.

4353. BURGERS, T. F. El crecimiento de los eucaliptos en regiones semi-húmedas y semi-áridas. [**Growth of Eucalypts in moderately wet and moderately dry regions.**] *Carib. For.* 21 (1/2), 1960 (24–37). [Span.span.]

Tabulates growth data of *E. globulus* for first (seedling) and second (coppice) rotations on five site qualities at Almonte (Spain) [cf. *F.A.* 16 No. 425], and discusses the Rio Tinto mines plantations (Spain) and those of the El Salvador Republic, with notes on the performance of other Eucalypts (at Almonte 14, Rio Tinto 8, El Salvador 9). Relevant climates and homoclimes (Oceania, Mediterranean, El Salvador) are sketched, with lists of likely species from the tropical, subtropical, and cool zones (Philippines to Australia).

4354. KRAAYENOORD, C. W. S. VAN. **The Chilean or Semi-Evergreen Lombardy Poplar.** *Farm For., Wellington* 1 (4), 1959 (88–9).

[Cf. *F.A.* 5 p. 22.] This variety was introduced into New Zealand from S. Africa in 1948. Its semi-evergreen habit makes it an excellent tree for shelter purposes, and cuttings grew 8–10 ft. in one year vs. 6 ft. for the common Lombardy Poplar. It has so far been given no special botanical name.

232.12. Races and Provenance Trials

See also Nos. 4089, 4092, 4099–4103, 4105, 4177, 4225, 4339.

4355. MAYER, H. Waldbauliche Beiträge zur genetischen Beurteilung der Lärche. [**Silvicultural points on the genetic evaluation of Larch.**] *Forstwiss. Cbl.* 80 (1/2), 1961 (29–48). 45 refs. [G.g.]

Discusses genetic differences in *Larix decidua*, the provenances used in the 18th and 19th centuries in the central European broadleaved forest area and their performance, and provenances for further planting. A table is constructed showing Larch provenances recommended for use on four types of site (subalpine to high-montane Spruce/Beech;

montane Fir/Beech or Beech; submontane Beech with Fir/Oak; colline Oak) outside the natural range of Larch.

4356. Šť'astný, T. Hodnotenie 50-ročného provenienčného pokusu so smrekovcom *Larix* sp. v polesí Likavka. **[Evaluation of the 50-year-old provenance trial with Larch at Likavka.]** *Ved. Práce Výskum. Úst. Lesn. Hosp. Bansk. Štiav.* No. 1, 1960 (155–75). 25 refs. [Slovak.russ.g.]

The trial plots at Likavka [cf. *F.A.* 21 No. 365] are at 780 m. alt., and comprise the following provenances of *L. decidua*: (*a*) Alpine, from 1200–1400 m. alt.; (*b*) Sudeten, 500–750 m.; (*c*) Carpathian, 1200–1400 m.; and also *L. leptolepis*. It was found that (*c*) has caught up with (*b*) in height, and has more cylindrical stems; (*c*) is expected to overtake (*b*) in the next ten years. Stem form, crown form and branchiness are the same in (*b*) and (*c*), but (*b*) suffers less than (*c*) from *Dasyscypha willkommii*. The (*a*) provenance is very disappointing, having the poorest height and volume, and the least resistance to *D. willkommii*. The *L. leptolepis* is also disappointing.

4357. Leibundgut, H. Beitrag zur Rassenfrage und zum Anbau der Schwarzföhre. **[Notes on races of *Pinus nigra*, and on its cultivation.]** *Schweiz. Z. Forstw.* 112 (2), 1961 (107–11 + 3 photos). 7 refs. [G.f.]

Phenological observations on provenances from Bosnia (2), Herzegovina, Serbia, and Calabria (1 each) indicated that there were small but often significant differences in the onset and development of flushing. More trial plantings, particularly of Italian and Jugoslavian provenances, are recommended and the potential use of these in the conversion of Chestnut stands is briefly discussed. [Cf. *F.A.* 20 No. 2804.]

4358. Hopkins, E. R. **Variation in the growth rate and quality of *Pinus pinaster* Ait. in Western Australia.** *Bull. For. Dep. W. Aust.* No. 67, 1960. pp. 33. 14 refs.

A fuller account of the provenance trials already noticed [cf. *F.A.* 21 No. 2994], giving experimental data.

4359. Sannikov, G. P. Osobennosti hoda rosta sosnovyh kul'tur v zavisimosti ot geografičeskogo proishoždenija semjan v Sobičskom lesničestve Sumskoj oblasti. **[Growth rates in *Pinus sylvestris* provenance trials in the Sobych forest district, Sumy region [N. Ukraine].]** *Lesn. Ž., Arhangel'sk* 2 (3), 1959 (46–52). 1 ref. [Russ.]

In 1954–55, investigations were made on the rates of growth of Kazan, Minsk, Vologda and Chernigov Pine provenances in trial stands established in 1912–16. These were also compared with local self-sown Pine. Data on the mean height, diameter, and volume increments are tabulated and show that the rates of growth of the Minsk, Kazan and Chernigov provenances are practically identical. The Vologda provenance is a long way behind them, but the growth rates of all four provenances began to surpass that of the local Pine after the age of ca. 15–20 years.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See section 165.3/.7.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 3987, 4450, 4570, 4576, 4589.

4360. Hovind, H. J. **The role of herbicides in establishing coniferous plantations.** *Proc. Jt. Mtg. 16th Nth. Cent. & 10th West Canad. Weed Control Conf.* 1960 (42). O.W.

In spring 1958, experiments were undertaken in the use of herbicides for the elimination of ground cover. Planting of two-year-old *Pinus resinosa* transplants and spraying were carried out in one operation, using, per acre: (1) simazin 3 lb., (2) simazin 1½ lb., (3) simazin 1½ lb. + dalapon 7½ lb., (4) dalapon 12 lb., (5) dalapon 7½ lb. + amitrol 3 lb., (6) amitrol 4½ lb.; a further plot (7) was furrowed only. Best initial tree growth was in (3) and (7); the thriftiest trees at the end of the growing season were in (5), (3) and (7). After the second growing season, following a drought in Aug. 1958, (1) and (3) were the thriftiest; (4) had some harmful effects on the trees. Both (4) and (5) had a quick initial effect on quackgrass, but not much residual effect; (1) and (2) had no effect for 5–6 weeks, but the residual effect held for most of the first growing season. On all the chemically treated plots the quackgrass recovered completely by the middle of the second season.

4361. Lisjutin, V. P. Issledovanie raboty kryla otvala lesnogo pluga. **[Investigation of the work of the mouldboard in a forest plough.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (132–51). [Russ.russ.]

Investigations were made on furrow formation, and on the effect of various attachments (spring plates, rollers, etc.) fitted to a forest strip plough to press down the furrow slice as it is inverted. The quality of the work that these performed is analysed, and conclusions are drawn regarding optimum design. It is thought that such an attachment is essential for good work, that the furrow slice should be pressed down by the ordinary forces acting on the plough, and that the attachment should be in the form of a runner or plate, which not only presses down the slice, but assists in inverting it; this allows a much wider choice of mouldboard shape. A roller also presses the slice down effectively, but cannot assist in inverting it, and so sets greater requirements on mouldboard design. [Cf. *F.A.* 22 No. 1789.]

4362. Hanbekov, I. I. Osnovnye voprosy agrotehniki lesorazvedenija v gornyh uslovijah. **[Basic problems in using agricultural techniques for forestry under mountain conditions.]** *Lesn. Hoz.* 12 (12), 1959 (31–7). [Russ.]

Discusses the performance of terracing and tillage equipment developed for use on slopes in the Crimea and Caucasus, comparing costs with those of hand labour, and discussing some plantation techniques for use on slopes.

4363. Shih, C.-S. Značenie sposoba podgotovki počvy pri kul′turah krymskoj sosny v gornyh uslovijah Južnogo berega Kryma. **[Importance of the method of soil preparation for plantations of *Pinus nigra* var. *caramanica* in the mountain conditions of the S. Crimea.]** *Lesn. Ž., Arhangel′sk* 3 (3), 1960 (15–9). 6 refs. [Russ.]

Compares the soil-moisture content during summer 1958 under Pine (1) planted in 1955 in completely tilled soil on the upper part of a W. slope of 14°; (2) ditto on terraces in the middle of a S.W. slope of 16°; and (3) planted in 1953 on patches 1·5 × 2 m. on the lower part of a S.W. slope of 14°. The rates of growth and the root systems are also compared. Method (1) was the best, and is recommended for (especially shady) slopes $\leqslant 15°$, the soil being tilled in strips $\leqslant 20$ m. wide and $\nless 50$–60 cm. deep. On slopes of $> 15°$, terraces should be made, with two rows of plants along the middle.

4364. Lupe, I. Pregătirea din toamnă a solului pentru semănăturile directe de molid ce se fac primăvară. **[Preparation of the soil in autumn for direct sowing of Spruce in the spring.]** *Rev. Pădurilor* 75 (10), 1960 (584–5). [Rum.russ.g.f.e.]

Autumn cultivation of the soil allows it to settle before sowing and prevents the exposure of seedling roots by later settling. In the spring the soil should be lightly scarified to a depth of 0·5–1 cm. along the contours, before sowing, and lightly firmed afterwards.

4365. Joshi, N. K. **Pulpwood agri-silvicultural plantations of Nimar.** *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (123–9).

A short account of recent experiments in establishing pulpwood plantations by taungya in Madhya Pradesh. Sites are cleared and ploughed by the forest department, and fields are then let to cultivators for 2 years at a nominal rent, the lessee undertaking to sow, weed, and beet up at his own cost. Species sown (at 13½ × 6 ft. spacing) are *Boswellia serrata*, *Ailanthus excelsa*, *Lannea grandis*, and *Kydia calycina*.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

4366. Ürgenç, S. Doğu lâdininde (*Picea orientalis* Lk. Carr.) kozalak ve tohum üzerine araştırmalar. **[Studies on the cone and seed of *P. orientalis*.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (2), 1960 (68–104). 45 refs. [Turk.e.*e*.]

Presents tabular and graphical data on maturity of cones and seeds, after-ripening, seed production and collection, morphology of cones and seeds, conditions for germination, and seed quality. All the salient points are given in the 6-page English summary.

232.311. Seed Production (Seed-Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 4215–6.

4367. Enescu, V. Cîteva observaţii asupra fructificaţiei bradului în Ocolul silvic Stalin. **[Seed production by *Abies alba* in the Stalin Forest District.]** *Rev. Pădurilor* 75 (12), 1960 (724–6). 4 refs. [Rum.russ.g.f.e.]

Contrary to the data in most of the literature, the author shows that *A. alba* in this region fruits annually, seed dispersal occurring at the beginning of October. There are 3 distinct cone types, based on the shape of bracts.

4368. Timofeev, V. P. Struktura urožaev semjan v sosnovyh nasaždenijah. **[Structure of seed harvests in Scots Pine stands.]** *Lesn. Ž., Arhangel′sk* 2 (3), 1959 (22–8). 21 refs. [Russ.]

Investigations were made in 1926–27 on a ¼-ha. trial plot (96 trees) in the *Pinetum vacciniosum* (age class VI) of the Bryansk experimental forest. Full data on tree size, and cone and seed yields, are given for each of the 96 trees. The four best yielding trees together gave 35·7% (by number), and 38·1% (by weight) of the seed harvest from the whole plot; the 9–10 best yielding trees gave 50%; and the 48 best yielding trees gave 95% of the total seed crop. Seeds from the biggest trees of tree classes II and I were clearly, and cones very slightly, larger and heavier than those from tree classes III and IV. For determining seed yield, the author considers that sampling should be done on trees of mean diameter and height for each of the tree classes I, II and III, as these are the classes which, to all intents and purposes, determine the size of the seed crop.

4369. Leuhina, T. A. Morfologičeskie osobennosti sejancev sosny obyknovennoj v zavisimosti ot stadijno-vozrastnogo sostojanija materinskih derev′ev. **[Morphological features of *Pinus sylvestris* seedlings in relation to the age and stadial development of the parent trees.]** *Lesn. Ž., Arhangel′sk* 2 (4), 1959 (40–5). 3 refs. [Russ.russ.]

A sample plot of 0·7 ha. of pure Pine, age class IV, was felled and the trees (>300) divided into four classes (assessed by height, diameter, crown projection, crown length and clear bole). Seed was collected from them, sown, and the 2-year seedlings divided by morphological features (height, length of main root, root-collar diameter, needle length, angle of side shoots, etc.) into four classes. Results are tabulated: they show a broad correlation between class of parent tree and % representation of seedling classes in the progeny. On the basis of these findings, recommendations are made on choice of seed-trees and grading of planting stock by morphological features.

4370. Borchers. Die Ausscheidung von Sonderherkünften im Lande Niedersachsen. **[Selecting "special provenances" in Lower Saxony.]** *Allg. Forstzeitschr.* 16 (16), 1961 (260–3). [G.]

Discusses criteria for certification by the German seed control association [cf. *F.A.* 20 No. 4432] for Spruce, Silver Fir, Scots Pine and European Larch, with notes on some certified stands, including their history and the regions for which their seed is suitable.

4371. Walters, J., Soos, J., and Haddock, P. G. **The selection of plus trees on the University of**

British Columbia Research Forest, Haney, B.C. *Res. Pap. Fac. For. Univ. B.C.* No. 33, 1960. pp. 11. 32 refs.

Detailed descriptions of 9 trees (4 Douglas Fir and 5 Western Hemlock) selected as "plus trees".

4372. Hashizume, H. **[The effect of gibberellin upon flower formation in *Cryptomeria japonica*.]** *J. Jap. For. Soc.* 41 (10), 1959 (375–81). 19 refs. [Jap.jap.e.*e.*]

Tabulates (in English) the results of repeated foliar spraying of one-year seedlings, one-year cuttings and 8-year saplings of *C. japonica*, with gibberellin in concentrations from 10 to 200 p.p.m. The effect on flower formation was far greater at high concentrations (>50 p.p.m.) than at low ones, particularly with the saplings, which bore more ♀ flowers at low concentrations (<50 p.p.m.), and more ♂s at high, the reverse obtaining with one-year-olds. Spraying was most effective from late June to late July, flowering being inhibited by spraying after mid-August. Pollen grains taken from such gibberellin-induced ♂ flowers were morphologically normal, as was their germination %. Spraying with K indole acetate, Na α-naphthalene-acetate, 2,4-dichloro-phenoxyacetate, and maleic hydrazide did not induce flowering.

4373. Melchior, G. H. Erhöhung der Blühwilligkeit an Pfropflingen der Japanlärche (*Larix leptolepis* (Sieb. und Zucc.) Gord.). **[Increasing the flowering of grafts of *L. leptolepis*.]** *Repr.* from *Naturwissenschaften* 47 (21), 1960 (502). 6 refs. [G.]

[Cf. *F.A.* 22 Nos. 401, 1709.] In a further series of experiments, 3- to 5-year grafts were treated by (1) strangulation, (2) bending the leader, or (3) girdling, in mid- to late May. In the following flowering season, the number of ♂ flowers was significantly increased by (2) and (3), the number of ♀ flowers only by (3). Full comparison of the methods showed success decreasing in the order (3), (2), (1); (1) was as effective as (3) by the second flowering season, but called for further work, in the removal of the aluminium bands, and damage caused to the bark was often slow to heal. With (3) the bark wound had healed by the end of the growing season. Another advantage of both (1) and (3) was that they reduced height growth and thus, in seed orchards, the need for pruning. There was some difference between clones in their reactions to the different treatments.

4374. Hoffmann, K. Grundlagen und Möglichkeiten des Baumschnittes in den Kiefernsamenplantagen. **[Basic techniques and possibilities of tree shaping in Pine seed orchards.]** *Forst u. Jagd* Spec. No. (*Samenplantagen*), 1959 (12–9). 7 refs. [G.g.]

Describes, with illustrations, four years' trials of horticultural training techniques on 6-year-old Scots Pine, particularly various methods of bud pruning to obtain the desired shape of crown and early flowering. Recommendations for seed orchards include crowns without a leader and espalier forms. Strangulation, ringing, or root pruning, alone or in combination with bud pruning, proved unsatisfactory.

4375. Johnsson, H. Kottskörd och fröutbyte från fröplantager av tall. **[Cone and seed yields from Pine seed orchards.]** *Svenska SkogsvFören. Tidskr.* 59 (1), 1961 (1–21). 10 refs. [Sw.sw.]

Analyses the 1959–60 cone crop of 867 litres, yielding 5·55 kg. of seed, from 608 grafts, aged 11–15 years, belonging to 83 clones, on four plots in S. Sweden. Yields, though varying greatly from tree to tree, were closely correlated with clones, the most important factor being a readiness to flower, which differed considerably between progeny from similar trees of the same stands and is considered either hereditary or induced by the physiological state of the scions; other clone-linked factors were % of empty seed, seeds per cone, and seed weight. No influence of the stock could be observed, but the lack of sufficient pollen—always a problem in young orchards—greatly reduced yields in one.

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

See No. 4370.

232.315. Seed Storage and Treatment

See also Nos. 4058, 4398.

4376. Cloud, M. **Cold storage containers for Pine seeds.** *Tree Plant. Notes* No. 45, 1961 (5–6).

Texas Forest Service has experimented successfully with 20 × 20 × 20-in. containers made of ¾-in. plywood, coated inside with paraffin wax, each holding 100 lb. of seed in sealed polythene sacks. The change from cylindrical steel drums to rectangular wooden containers has increased by 21% the quantity of seed that can be stored in the available space.

4377. Starčenko, I. I. Peresmotret′ sroki povtornoj aprobacii lesnyh semjan. **[Intervals between quality checks in [stored] forest seed.]** *Lesn. Hoz.* 13 (11), 1960 (28–30). [Russ.]

Reviews Soviet standards on seed quality checks, and presents a new schedule showing the frequency recommended for checks of stored seed (grades I–III) of *Pinus sylvestris*, *Picea abies*, *Betula verrucosa*, *Euonymus verrucosus*, *Tilia cordata* and *Caragana arborescens*, depending on the period of storage.

4378. Vlase, I. Contribuţii la studiul factorilor care favorizează mentinerea puterii germinative a seminţelor de brad în cazul unei păstrări mai îndelungate. **[Factors favourable to the maintenance of germinability in seed of *Abies alba*.]** *Rev. Pădurilor* 75 (8), 1960 (476–80). 9 refs. [Rum.russ.g.f.e.]

Tests of various methods of storing seed were made, and it was found that they may be stored for at least a year with no significant loss in germinative capacity, if first dried to 8–10% m.c. and stored in hermetically sealed glass bottles in a cellar where maximum summer temperature does not exceed +15° C. This is much more practical and economical than refrigeration.

4379. ŽIGANOV, JU. I. Vlijanie izmenenija vlažnosti, temperatury i aèracii želudej na ih žiznesposobnost′. **[Influence of changes in moisture, temperature and aeration on the viability of [stored] acorns.]** *Lesn. Ž., Arhangel′sk* 2 (3), 1959 (40–5). 4 refs. [Russ.]

On the basis of Soviet work, concludes that acorns should be stored in a very moist medium which will keep the acorns at ≮44–45% m.c. Temperatures in storehouses below −3° C. are undesirable, and below −5 or −7° C. inadmissible.

4380. HOPKINS, E. R. **Germination stimulation in *Pinus pinaster* Ait.** *Bull. For. Dep. W. Aust.* No. 66, 1960. pp. 10. 7 refs.

The germinability of *P. pinaster* seed imported into Australia from Portugal may be significantly improved by using pre-sowing treatments incorporating both cold soaking and stratification. In trials carried out in W. Australia in recent years, both the rate of germination and the total germination were thereby significantly increased. Seed treated in 1958 gave 80% germination in 28 days as compared with 38% for untreated seed under the same conditions. Comparable values for 1959 trials over a 23-day period were 86 and 55% respectively. The final results of treatments tested were markedly influenced by both the duration of the soaking and the duration of the stratification treatment employed. Most favourable responses were obtained by stratifying the seed for 7 to 9 weeks at 36° F. after soaking for eight days in water at room temperature. Drying the seed before sowing did not impair the effect of treatment. Such treatment is practical for large quantities of seed with either slight or pronounced dormancy tendencies. *From author's summary.*

4381. JENKINS, M. E. **The effect of gibberellin on the germination rate of Eastern White Pine.** *J. For.* 59 (3), 1961 (210–1). 4 refs.

Lots of 50 unstratified *Pinus strobus* seeds were soaked for 12, 24, 48 and 96 hours in (*a*) 100, (*b*) 500, and (*c*) 1000 p.p.m. of gibberellic acid. Some variations in germination rate were noted. The increase in germination % over controls soaked in distilled water was greatest with 24- and 48-hour soaking using (*a*) and (*b*). The effects, however, were not sufficient to warrant the expense and time involved for field sowing of *P. strobus*.

4382. ODARIČ, T. P. Ispol′zovanie geteroauksina i gibberellina pri vyraščivanija platanov. **[The use of IAA and gibberellin in growing *Platanus* spp.]** *Bot. Ž.* 45 (12), 1960 (1810–2). 6 refs. [Russ.]

In view of the considerable difficulties experienced at Kiev in raising *Platanus* spp., by seed and by cuttings, owing to frost damage to the plants when small, attempts were made to force them by soaking the seeds for 24 hours in, and weekly spraying of the young plants with, a 0·0005% solution of IAA. Taking controls as 100, the mean height of two-year treated seedlings of *P. orientalis* was 167, of *P. occidentalis* 198, and of *P. acerifolia* 200. In another trial on 3-year plants, in which one of the two leading buds had been removed to prevent forking, drops of gibberellic acid (0·002% aqueous solution) were applied to the leading buds. Taking controls as 100, the mean height increment of *P. orientalis* was 267, of *P. occidentalis* 295, and of *P. acerifolia* 307.

4383. MCCONNELL, B. R. **Effect of gibberellic acid and cold treatments on the germination of Bitterbrush [*Purshia* sp.] seed.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 187, 1960. pp. 4.

The combined effects of gibberellic acid and cold were studied by varying both the strength of acid (25–1000 p.p.m.) and the length of cold (7–30 days). The effects of each treatment, and of the interaction of the two, were highly significant, germination increasing with acid concentration and length of cold period. [Cf. *F.A.* 21 No. 1723.]

4384. SAATÇIOĞLU, F., and ÜRGENÇ, S. Doğu kayın (*Fagus orientalis* Lipsky) tohumlarının çimlendirilmesinde soğuk—slak işlemin etkileri üzerine araştırmalar. **[Experiments on the effect of cold and wet pre-treatment on the germination of *F. orientalis* seed.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (2), 1960 (7–26). 4 refs. [Turk.g.*g*.]

In investigations in 3 years, samples were collected from 17 different areas. Germination was tested at once, and after 7–121 days in wet sand at 4–6° C. This cold and wet pre-treatment for 9–15 weeks improved germination considerably. The seed moisture content below which viability declines is lower in *F. orientalis* than in *F. sylvatica*, but Rohmeder's recommendations for stratification of *F. sylvatica* [see *F.A.* 13 No. 1048 (item 7)] are generally suitable for *F. orientalis* too.

4385. LJUBČENKO, V. M. O nabuhanii semjan lipy melkolistnoj. **[Swelling of seeds of *Tilia cordata*.]** *Lesn. Ž., Arhangel′sk* 3 (3), 1960 (44–8). 5 refs. [Russ.]

[Cf. *F.A.* 21 Nos. 4302–3.] Tabulates data on the swelling of the seeds when soaked in water after various dates of harvesting and periods of storage, and the effects of various periods of stratification, pericarp removal, etc.

4386. LJUBČENKO, V. M. Vlijanie temperatury počvy v osenne-zimne-vesennij period na podgotovku semjan k prorastaniju. **[Effect of soil temperature in autumn, winter and spring on the preparation of seeds for germination.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (169–72). 1 ref. [Russ.]

Reports further stratification studies with *Tilia cordata* and *Euonymus europaeus* [cf. *F.A.* 21 Nos. 4302–3; 22 No. 2881.]

4387. LUPE, I. Scarificatoare pentru seminţele de salcîm şi de alte leguminoase ce germinează greu. **[Scarification of seed of Robinia and other leguminous plants slow to germinate.]** *Rev. Pădurilor* 75 (4), 1960 (212–5). [Rum.russ.g.f.e.]

Describes (with scale diagrams) some scarifying machines, and recommends scarification of Robinia seed in preference to hot-water soaking.

4388. SUSZKA, B., OHBA, K., and SIMAK, M. Über das Wachstum von Kiefernsämlingen aus röntgenbestrahltem Samen. **[The growth of Pine**

seedlings from seed irradiated with X-rays.] *Medd. SkogsforsknInst., Stockh.* 49 (9), 1960. pp. 18. 15 refs. [G.sw.e.]

In an investigation on fully developed *Pinus sylvestris* seed irradiated with 600, 1200, 2400, 3600 or 4800r, total growth and maximum daily growth decreased, while cotyledon emergence time, seedling mortality, and abnormal cell division in the root tips increased with increased doses. At 4800r, no cotyledons emerged within 14 days, but even in this series, some seedlings had no abnormal cell divisions. The two weakest doses had little or no effect on results. The quantity of seeds did not suffice for a comparison of germination rates or %s, but with the two largest dosages, <30% of the irradiated seed began to germinate.

4389. RITSLAID, V. Aeroionisatsiooni mõjust seemnete idanemisele ja taimede kasvule. **[Effect of ionized air on germination and plant growth.]** *Eesti NSV Tead. Akad. Toimet. (biol. Seer.)* 9 (2), 1960 (167–79). 5 refs. [Est.russ.g.] W.A.H.

The experimental material included seeds and seedlings of *Euonymus europaeus*. Treatment of the seeds with ionized air for 5–20 min. daily for 15 days in Nov.–Dec. caused improved seedling growth which was still noticeable at the end of the third growing season. Similar treatment in March, however, resulted in growth poorer than that of controls, and it appears that the efficiency of the treatment depends on the time during dormancy when it is given. Treatment of seedlings (3–16th June) resulted in height growth 26·7% greater in that growing season than that of untreated controls.

4390. PRISJAŽNJUK, A. A. Gribnye bolezni semjan i šišek hvojnyh porod. **[Fungal diseases of seeds and cones of conifers.]** *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (31–7). 12 refs. [Russ.]

Lists, with their hosts, 73 species of fungi found in laboratory studies of seed samples of *Pinus sylvestris, Picea abies, Larix sibirica* and *Abies sibirica* from various parts of the U.S.S.R. An analysis was also made to determine when, to what degree, and by which fungi, the seeds of Pine and Spruce are infected. This revealed no infection of seeds from unopened cones taken straight from the tree; slight infection of seeds from cones that had begun to open on the tree; ca. 50% of seeds from cones stored in bins were infected; and 100% of seeds kept in a storehouse. The fungus species concerned in the last two cases were mostly saprophytic. In a special trial with Pine seed, infection was worst in sacks, next in boxes, then in zinc containers, and least in hermetically sealed bottles. The most common fungus on Pine seed was *Penicillium glaucum. Fusarium* and *Alternaria* attacked 1–3% of the seed. General recommendations are made on seed storage and treatment.

4391. PRISJAŽNJUK, A. A. Vlijanie različnyh protravitelej na ėnergiju prorastanija, tehničeskuju i gruntovuju vshožest' semjan listvennicy sibirskoj. **[Effect of various disinfectants on the germinative energy, and laboratory and field germination of seeds of *Larix sibirica*.]** *Lesn. Ž. Arhangel'sk* 3 (4), 1960 (156–7). 2 refs. [Russ.]

Tabulates data on germination, for mainly the same treatments [see next abstract]. All increased germinative energy and laboratory germination, and all, except merkuran, increased field germination.

4392. PRISJAŽNJUK, A. A. Vlijanie različnyh protravitelej na ėnergiju prorastanija i vshožest' semjan sosny obyknovennoj. **[The effect of various disinfectants on the germinative energy of Scots Pine seeds.]** *Lesn. Ž., Arhangel'sk* 2 (6), 1959 (19–23). 13 refs. [Russ.]

Tests were made with: (1) formalin (2 hr. in 0·15% solution), (2) formalin (5 min. in 0·15% solution followed by 2 hr. in formalin fumes), (3) $KMnO_4$ (30 min. in 3% solution), (4) $KMnO_4$ (3 hr. in 0·5% solution), (5) thiram 50% (3 g. to 1 kg. of seed), (6) dinitro-trichlorobenzene (6 g. to 1 kg. of seed), (7) granosan (2, 3, 4 and 5 g. to 1 kg. of seed), (8) merkuran [ethylmercuric chloride + γ-BHC] (3, 4, 5 and 6 g. to 1 kg. of seed). Results are tabulated. Of the liquids, (3) and (4) were the best. Germination was reduced by (2), and especially by (1). Of the dry disinfectants, (7) and (8) increased germination, and (5) and (6) did not reduce it. Field tests confirmed that all, except formalin, increased field germination by 3–31%; formalin reduced it by 1·2–9·1%.

4393. KRÁL', V. K otázke účinku predsiatbového morenia agronalom na klíčivosť semena borovice sosny—*Pinus sylvestris* L. **[The effect of pre-sowing treatment with Agronal on the germination of *P. sylvestris* seeds.]** *Ved. Práce Výskum Úst. Lesn. Hosp., Bansk. Štiav.* No. 1, 1960 (25–35). 8 refs. [Slovak.slovak.russ.g.]

P. sylvestris seeds from 12 localities in Slovakia were treated with Agronal [see *F.A.* 21 No. 1692] at rates of 0·4, 0·5, 0·6, and 0·7% by weight, and the effects on germination were studied. Results, analysed statistically, showed that germinative energy was virtually unaffected by the treatment, but germination % was increased. The 0·6% treatment was the best.

4394. KOZLOWSKI, T. T. **Effect of seed pelleting on germination of Pine seed.** *For. Res. Note Wis. Coll. Agric.* No. 60, 1960. pp. 3 + 1 tbl. 1 ref.

It was found in germinator and greenhouse tests that pelleting seed of (*a*) *Pinus resinosa* and (*b*) *Pinus strobus* with 75% Arasan in a latex or methylcellulose binder inhibited early germination compared with controls merely dusted with Arasan. After 30 days, however, there was no significant difference between germination of pelleted and unpelleted (*a*) seed. After 60 days, more pelleted (*b*) had germinated than unpelleted, where dusting with Arasan failed to control damping-off. Latex binders inhibited germination less than methylcellulose.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 4102, 4221, 4377.

4395. CHING, T. M., and JENSEN, L. A. **Sampling experiments of coniferous tree seeds for testing.** *Proceedings of the Association of Official Seed*

Analysts, Madison 1959, 49 (1), 1960 (49–55). 4 refs. A.P.B.

Tests on different lots of Douglas Fir, Ponderosa Pine and *Abies procera* seeds indicated that purity, seed weight, moisture content, and viability, varied between the containers of a lot, and that, within a container, chaff and light seed tended to be found near the top. Samples should therefore be taken from all levels of all containers in a lot.

4396. Jensen, L. A., and Noll, E. **Experience in germination testing of Pacific Northwest Douglas Fir seed.** *Proceedings of the Association of Official Seed Analysts, Madison 1959*, 49 (1), 1960 (107–13). 7 refs. (*Tech. Pap. Ore. Agric. Exp. Sta.* No. 1236.) A.P.B.

In tests with varying conditions, an alternation of 20 and 30° C. was found best. Germination was generally increased by 2 weeks' pre-chilling at 5° C., either in soil or in containers after soaking. As some batches, presumably owing to the absence of dormant seed, did better without pre-chilling, double testing is recommended. Dormancy (and the pre-chilling effect) varied over the year, and increased with storage.

4397. Čabrajić, T. Prilog poznavanju uticaja staništa na dimenzije šišarica i kvalitet sjemena crnog bora. **[The influence of site on the cone dimensions and seed quality of *Pinus nigra*.]** *Nar. Šumar, Sarajevo* 14 (7/8), 1960 (364–71). 9 refs. [Serb.g.]

Tabulates the results of measurements of cones and germination tests of seed from 3 sites on (*a*) calcareous rock, (*b*) serpentine, and (*c*) gabbro. Seed from (*b*) and (*c*) was superior in quality to that from (*a*); the difference was attributed to the soil properties of the sites.

232.32. Plant Rearing. Nursery Practice

See also Nos. 4157, 4326.

4398. Forstgärten. **[Forest nurseries.]** *Allg. Forstztg.* 72 (5/6), 1961 (47–60). Many refs. [G.]

A special number including articles on: The Austrian state nurseries (*M. Ecker*); Spacing in nurseries, and the raising of seedlings for direct planting out (*H. Riedl*) [recommending widely spaced double rows for mechanized weeding and, where plants are increasingly sold as 3 + 0, double rows of these with single rows of transplant seedlings in between]; Shading (*H. Steiner*) [cf. *F.A.* 20 No. 4470]; Raising seedlings without loss [cf. *F.A.* 21 No. 3041] and Christmas-tree plantations (*Neubacher*) [describing growing 3–4 "Christmas trees" from branches turning upright after removal of the leader]; Afforestation trials with peat pots (*Oberbichler*) [results were good but transport to roadless mountain sites was difficult]; Fungicides in nurseries (*H. Resch*) [seed dressings increased slightly, and soil sterilization with Trapex substantially, the numbers of Larch and Spruce]; Weed control with simazine (*Oberbichler*) [injuries to Spruce and Larch, reported from some nurseries, appeared to be connected with soil, and the weather during treatment].

4399. Ljubčenko, V. M. Vyraščivanie sejancev listvennicy sibirskoj v leshozah lesostepi i Poles'ja USSR. **[Raising seedlings of *Larix sibirica* in the leskhozes of the forest-steppe and Poles'e areas of the Ukraine.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (79–89). 20 refs. [Russ.]

Recommendations on soil, moisture, light, soil preparation, seed treatment, sowing, and tending, from observations in many nurseries raising *L. sibirica* from seed from the Altai and Krasnoyarsk regions.

4400. Baur, G. N. **Nursery spacing and grading of Slash Pine seedlings.** *Res. Note For. Comm. N.S.W.* No. 5, 1960. pp. 8. 1 ref.

Studies of *Pinus elliottii* in the nursery are described. Results indicate that: (1) a stocking of ca. 30 seedlings/sq. ft. should be aimed at; (2) 1 + 0 seedlings of small size and lacking secondary needles and resting buds should be culled, but other 1 + 0 grades give satisfactory survival and growth; 2 + 0 stock is unsuitable for planting.

4401. Karaçamın fidanlıklarda yetiştirilme tekniği üzerinde denemeler. **[Experiments on techniques of growing *Pinus nigra* in nurseries.]** *Extr.* from *Orm. Araşt. Enst. Yıl. Bült.* No. 7, 1958 (2–5, 36–7). [Turk.e.]

Early spring (March) sowings gave best results (survival and height growth), followed in order by April and May sowings, and early autumn sowings (satisfactory germination, but heavy losses from early frost); seeds sown in November and December failed to germinate before the winter, in the course of which all were eaten by birds. Crushed stone or decomposing sawdust used as seed covering gave better seedling survival and height growth than mulch, sand, or sand + loam + cow dung. At the end of the first growing season, survival and height growth of seedlings were found to have increased with increasing degree of shading. *From author's summary.*

4402. Badea, M., Constantinescu, N., and Mihalache, V. Cultura fagului în pepinieră. **[Raising Beech in the nursery.]** *Rev. Pădurilor* 75 (10), 1960 (581–4). 11 refs. [Rum.russ.g.e.f.]

Experiments were made with autumn and spring sowings, at different depths (7 variants), with pre-germinated seed, and with different degrees of shade. Results were compared with controls from natural regeneration. The results indicate that autumn sowings should be at a depth of 5–6 cm., spring ones at 2–3 cm. Seed for spring sowing should be stored in moist forest humus. Shade is essential during the first growing season, and can be satisfactorily supplied by a leaf-covered framework 1·5 m. above the grounds. In order to get full benefit from the shade, rows should be oriented N.–S. During the second year, shade is removed and the 2-year seedlings are ready for planting out in the open field or on cut-over sites. By this method a yield of 254 one-year, or 230 two-year seedlings per sq. m. can be obtained.

4403. KISRÓMAI, A. Az árbócakac szaporításának kísérleti eredményei. **[Results of research on the propagation of *Robinia pseudoacacia* var. *rectissima*, the Shipmast Locust.]** *Erdö* 10 (3), 1961 (97–100). [Hu.g.russ.]

From 12,460 root cuttings, 2046 one-year plants were raised. Budding has so far failed, as the scion develops a sabre curve and is very easily broken off. Raising from seed is satisfactory; from 400 g. of clean seed 2300 plants, 80–120 cm. high in the first growing season, have been obtained.

232.321. Nursery Sites, including Factors affecting Selection of Sites for Nurseries

4404. KOTEŠOVEC, V. Krugovoj lesnoj pitomnik. **[A circular forest nursery.]** *Lesn. Hoz.* 12 (12), 1959 (80–3). [Russ.]

[Cf. *F.A.* 14 No. 2166; 19 No. 2928; 21 No. 4310.] Describes a forest nursery at Brno, Czechoslovakia, produced by clearing a circular (annular) strip 24·5 m. wide in the forest, round a central "island" of forest of radius 15·5 m., which is left standing. The width of the circular nursery strip and the radius of the central island both depend on the height of the surrounding stand. This circular nursery design (in which the seed and plant rows are arranged in concentric circles broken by radial access tracks for the machinery) possesses all the advantages of small forest nurseries as regards growing conditions, while at the same time allowing a degree of mechanization similar to that normally possible only in very large nurseries.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

4405. WITTICH, W.; FIEDLER, H. J.; KRAUSS, H.-H. Möglichkeiten der Produktionssteigerung in der Forstwirtschaft durch Düngung und die sich daraus ergebenden Forschungsprobleme. **[Raising productivity in forestry by fertilizing. Potentialities and research problems.]** *S.B. Dtsch. Akad. Landw-Wiss., Berl.* 9 (6), 1960. pp. 72. 60 refs. [G.g.e. russ.]

Three lectures, including some descriptions (published and unpublished) of recent and current research at Tharandt (*Fiedler*) and Eberswalde (*Krauss*). Some data are given on: the effect of Ca and Mg on microfungi and other organisms in Pine and Spruce raw humus; the after-effects of litter-raking on Pine; nursery soil investigations; a deficiency trial in Pine plantations; pot trials on N/P/K ratios and the growth of Spruce, etc.

4406. HOLSTENER-JØRGENSEN, H. Eftervirkningen af planteskoleplanters ernæringstilstand i det første kulturår. **[The effect of the nutrient status of nursery plants on their development during the first year after planting out.]** *Forstl. Forsøgsv. Danm.* 26 (3), 1960 (371–87). 6 refs. [Dan.dan.e.*e*.]

Norway Spruce, from nursery fertilizer trials relating to Mg deficiency already described [see *F.A.* 20 No. 1925], was planted out in 1958 on: (1) clear-felled areas, formerly Oak and Beech, on moraine clay; (2) wet peatland from which Birch but not *Sorbus aucuparia* had been removed; (3) grass-grown heathland. On all three areas significant differences in leader length developed in autumn 1958 between plants from the various batches, representing different fertilizer treatments. The effect of N was positive and significant in all areas, that of P positive in (1) and (2) and negative but not significant in (3), and that of K negative but not significant in all areas. The results show that plants given adequate nutrients in the nursery are the best suited for planting out. The plants on (1) treated with NPMg fertilizer had a mean leader length of 8·53 ± 0·22 cm. (the highest value obtained on this area) and those treated with PKMg one of 4·34 ± 0·22 cm. (the lowest value).

4407. KANTOR, J., and VOLNA, M. Sadební material jako základní předpoklad zalesňování. **[Planting stock as a basic prerequisite for afforestation.]** *Sbornik Vysoké Školy Zemědělské a Lesnické v Brne, Řada C* 1959 (1/2), (37–56). 8 refs. [Cz.cz. russ.g.] L.S.

Presents the results of a study of the effects of (1) peat-manuring and (2) shading, on the physical quality of planting stock grown from (*a*) *Pinus sylvestris*, (*b*) Douglas Fir, (*c*) Larch, (*d*) Oak, and (*e*) Beech seed sown in a nursery near Brno at 380 m. altitude on a deep, permeable loam (mean annual rainfall 563·2; in the growing season 347 mm.). Results indicated that: (1) the high acidity of peat applied to (*a*) had very deleterious effects on germination and on the number of one-year seedlings emerging, emergence of 35 and 42% occurring respectively for peat applications of 120 and 90 cu. m./ha. compared with untreated control plots; for (*b*) an application of 30 cu. m./ha. gave good quality and a beneficial effect on height (ht.) growth, the mean volume (vol.) and ht. of the seedlings being 20% greater than those of untreated controls; for (*c*) an application of 30–60 cu. m./ha. gave similar results to untreated controls, while above this the number of seedlings emerging dropped by 6–12%, with a corresponding reduction in ht. and vol. to 85 and 65% compared with controls; for (*d*) the results obtained were too heterogeneous to allow satisfactory conclusions to be drawn; for (*e*) results for seedling emergence were similar to those for (*a*), but no conclusions could be drawn as regards their quality based on ht., root length, diameter etc. (2) For (*a*) no shading was used; for (*b*) the quality of shaded seedlings, expressed as ht. and vol., was better than that of unshaded seedlings; for (*c*) the mean ht. of shaded seedlings was 7–22% greater than unshaded ones; for (*d*) no conclusive results were obtained; and for (*e*) the results were not conclusive, though the observed growth of shaded seedlings was invariably slightly greater than that of unshaded seedlings. In conclusion, because of the high acidity of pure peat, its application is not recommended despite its apparent advantages, and for future work composting of the peat is suggested to offset its initial acidity. Similarly, despite the promising general results of shading, further investigations are needed to work out the details of shading methods for individual species.

232.323. Sowing and Covering

4408. MARJAI, Z. Nyár csírázásélettan, ökológia és magvetés. **[The physiology of germination, ecology and sowing of Poplar.]** *Erdö* 9 (12), 1960 (471–80 + smries. in suppl.). 16 refs. [Hu.g.russ.]

Recommends, from 7 years' research, a 30–40% cover of seedbeds with straw where the soil is friable; where it is compact, 3–4 mm. of humus or ground peat instead. The danger is caking from watering. The raising of Aspen should be transferred from the hills to the plains or else resort should be had to cold-frame methods.

4409. WATT, R. F. **Artificially extended photoperiod increases size of nursery stock.** *Minn. For. Note* No. 104, 1961. pp. 2. 1 ref.

Experiments in long-day (20-hour) treatment of (*a*) White and (*b*) Red Pine and (*c*) White and (*d*) Black Spruce in the nursery showed significantly greater height growth of (*a*) and (*b*), but not of (*c*) and (*d*), in the first growing season, and significantly increased height of (*b*), (*c*) and (*d*) at the end of the second growing season.

4410. GIORDANO, E. La coltura idroponica degli eucalitti. **[Hydroponic culture of Eucalypts.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (259–69 + 2 plates). 10 refs. [It.it.e.]

Preliminary results indicate that *E. rostrata*, *E. trabutii* and *E. leucoxylon* can be grown satisfactorily in either water or vermiculite cultures, *E. botryoides* only in water culture; *E. globulus* and *E. viminalis* failed in both.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also No. 4369.

4411. FERCHER, W. Verschulung von Forstpflanzen im Zusammenhang mit der Weiterentwicklung eines Längsreihenverschulapparates. **[Lining-out, and the development of a lining-out board for longitudinal rows.]** *Allg. Forstztg.* 72 (7/8), 1961 (73–5). [G.]

Discusses tests in a Carinthian nursery, where fairly close spacings of 10 cm. between, and 4–5 cm. within, rows gave plants of the most uniformly good quality, and describes a lining-out board modified for use with longitudinal rows (for ease of mechanical weeding). This 3-m. board is edged with aluminium having notches to hold 120 plants, and is hinged to a kneeling-board which is also used to tip back soil into the trench; with it, 3 women can line out 18,000 to 21,000 plants per 9-hr. shift. [Cf. *F.A.* 21 No. 4320.]

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 4673–6, 4770, 5117–20.

4412. Dursunbey Orman Fidanlığında mihaniki ve kimyevi ot mücadelesi denemeleri. **[Mechanical and chemical weed control in the Dursunbey Forest Nursery.]** *Extr.* from *Orm. Araşt. Enst. Yıl. Bült.* Nos. 7, 1958 (5, 37–8); 8, 1959 (2, 49). [Turk.e.]

Second-year shoots of seedlings on plots treated with Dow-fume MC2 were short and weak, possibly because soil micro-organisms had been destroyed by the application. Survival and height growth of seedlings were not, however, affected by Stodart Solvent treatment. First-year field survival of plants grown in nursery beds treated with Dow-fume MC2 or Stodart Solvent did not differ significantly from that of plants grown in mechanically weeded nursery beds. *From author's summary.*

4413. SILKER, T. H. **Preliminary chemical weed control tests in a Southern Pine nursery.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (83–8). 4 refs. O.W.

In pre-sowing tests, (1) Vapam at 100 gal./acre and (2) MC-2 [MeBr-type] at 435 lb./acre gave distinctly better control of Bermuda grass than (3) Shell AA [allyl alcohol] 72·5 gal./acre, (4) Shell DD [dichloropropane + dichloropropene] 25 gal., (5) Mylone 544 lb., (6) Simazine 50W 4 lb. and (7) Telone 40 gal.; (1) had a slight advantage over (2) and was also cheaper and easier to apply. In pre-emergence treatments (i.e. between sowing and emergence of the Pine) Dow General Weedkiller [55% dinoseb] at 3 pints/acre gave better initial control of *Cyperus* spp., *Ambrosia* spp., *Gnaphalium* spp., *Oeneria* spp. and others than (6) at 1–4 lb./acre, CIPC 8 lb., Eptam (EPTC) 2–6 lb., or Dow Premerge [dinoseb (amines)] 3 gal. Pines were not injured by any treatment. In post-emergence treatments oils gave better control of the above weeds than Fasco Flame [PCP-type], amitrol [amino-triazole] at 1 and 2 lb./acre, Simazine 3 lb. + amitrol 2 lb. or G56 in oil. Results of chemical treatment of a green-manure clover crop are also given.

4414. UHLIG, S., and ZENTSCH, W. Unkrautbekämpfung mit W 6658 in Forstpflanzgärten. **[Weed control in nurseries with W 6658.]** *Forst u. Jagd* 11 (2), 1961 (85–7). [G.]

Presents results of practical trials in E. Germany with W 6658, an aminotriazole derivative insoluble in water. Pre-emergence treatments with 3–4 kg. in 600–1000 litres water/ha. gave good control of annual weeds in transplant beds for ca. 1 year; but the higher doses necessary for killing deep-rooting weeds would harm forest plants. Of these, Oaks and Spruce were the most, and Ash and European Larch the least resistant. The chemical proved more potent in sorptive soils. It is not recommended for seedbeds except for Oak.

4415. **1960 technical information. Dicryl, an experimental herbicide.** Research and Development Department, Niagara Chemical Division, Middleport, N.Y. [1960.] pp. 12. O.W.

Presents information on the chemical and physical properties of Dicryl (N-(3,4-dichlorophenyl) methacrylamide) and its action on some common weeds. *Taxus cuspidata* and *Thuja orientalis* are tolerant of normal dosages, but seedbeds of Larch, *Picea glauca* and *Pinus sylvestris* proved susceptible.

4416. **Technical information 1960. Solan, an experimental herbicide.** Research and Development Department, Niagara Chemical Division, Middleport, N.Y. [1960.] pp. 9. O.W.

Presents data on the chemical and physical properties of Solan (N-(3-chloro-4-methylphenyl)-2-methylpentanamide) and its action on some common weeds. It has been used with success in seedbeds of *Pinus sylvestris* and *Picea glauca*.

4417. Sonderheft Unkrautbekämpfung. **[Special number: weed control.]** *Forst- u. Holzw.* 16 (5), 1961 (105–22). Many refs. [G.]

A collection of papers: Organization, output, and cost of work in chemical weed control in the open and in the stand (*H. Neuser* and *J. Peine*) [total costs with knapsack sprayers, not counting herbicide costs, were DM. 40–45 under easy conditions, and can exceed DM. 60/ha. in difficult conditions]; Using chemicals for weed control in plantations and in afforesting meadowland (*H. Bossel*) [discussing the use of Dowpon for weed control in Norway Spruce, or before planting it]; Can chemical weed control reduce the costs of conifer plantation establishment? (*H. Junack*) [chemical weed control in summer, followed by planting in the following spring, has given good results]; Possibilities for eliminating weed competition in nurseries (*Zeyher*) [a comparison of methods and costs in seed- and transplant beds]; Weed control in nursery seedbeds (*H. Faber*); Experiences with simazine in forest nurseries in Baden-Württemberg (*R. Olberg*); Weed control in forestry (*H. H. Cramer*) [a review of a book—see *F.A.* 22 No. 1985].

4418. STORCH, K., and DEPPENMEIER, E. Schwerpunkte der chemischen Unkrautbekämpfung. **[Key points of chemical weed control.]** *Forsttech. Inform., Mainz* 1961 (2/3), (9–23). 8 refs. [G.]

Reports on a meeting at Giessen, summarizing practical experience in Germany in nurseries (chiefly with Alipur for seedbeds and simazine for transplant beds), clear fellings and older stands, including control of broadleaved trees and shrubs in conifer plantations and also weeding and cleaning in young hardwood stands.

4419. ZENTSCH, W. Über die Anwendung von Simazin in Forstpflanzgärten. Vorläufige Mitteilung. **[Use of simazine in forest nurseries. Preliminary report.]** *Arch. Forstw.* 9 (11), 1960 (1049–50). [G.]

[Cf. *F.A.* 20 No. 4464.] Applications of 1–4 kg./ha. were made on transplant lines of (*a*) *Pinus sylvestris*, (*b*) *P. strobus*, (*c*) Spruce, (*d*) Douglas Fir, (*e*) Sycamore Maple, (*f*) Ash, (*g*) Alder, and (*h*) Larch. The very dry season militated against weedkiller action and the receptivity of the transplants. Type of soil is important, the weedkiller being more toxic in humus-deficient soils. A rate of 4 kg./ha. on transplants (*a*) to (*d*) at the beginning of spring or end of winter guaranteed freedom from germinating weeds to midseason without harming the transplants. On poor sands deficient in humus, 1·5 kg./ha. should not be exceeded for (*f*) to (*h*). This could be raised to 2 kg. with higher humus content. With deep-sown large seeds (Red Oak, Beech), treatment at 4 kg./ha. 14 days after sowing will not harm the seedlings. Spruce and Pine sown at the end of April can be treated with 1–2 kg./ha. at the end of July. Willow propagation plots can also be treated at 4 kg./ha.

4420. GATHY, P. Le désherbage sélectif en pépinière forestière. Un nouvel herbicide: le simazin. **[Selective weed control in a forest nursery. A new weedkiller—simazine.]** *Bull. Soc. For. Belg.* 68 (1), 1961 (1–17 + 2 photos). 11 refs. [F.f.]

Experiments carried out at several nurseries in Belgium confirm the remarkable efficacy of simazine as a weedkiller. The following practical conclusions are drawn from the results: (1) Simazine is relatively ineffective against species with very deep roots or rhizomes. Dosages as low as 0·4 g./sq. m. are effective. (2) Conifers appear to have a specific resistance to simazine, irrespective of their root systems or of age; hardwoods appear to be susceptible and are safe only when deeply rooted (e.g. rooted Poplar cuttings). (3) The residual activity of simazine appears to last for more than a year; its effect on later crops depends on their nature. Even quite young conifer seedlings show no susceptibility to injury, but hardwoods should probably not be tried on soil treated in the previous year.

232.327. Protection Measures in Nurseries

See Nos. 4163, 4407, 4709–11, 4713, 4715–7.

232.328. Vegetative Propagation

See also Nos. 4068, 4739, 4991–2.

4421. FRÖHLICH, H. J. Untersuchungen über das physiologische und morphologische Verhalten von Vegetativvermehrungen verschiedener Laub- und Nadelbaumarten. **[The physiological and morphological behaviour of some vegetatively propagated broadleaved or coniferous trees.]** *Allg. Forst- u. Jagdztg.* 132 (2), 1961 (39–58). 29 refs. [G.g.e.]

Describes experiments with nearly 3000 branch cuttings (including epicormics) of *Populus nigra* var. italica and *P.* × *berolinensis*, and cuttings or grafts of other species. In the Poplars no significant correlation was found between rooting capacity or early growth and the level at which cuttings were taken, and a tendency for responses to be better in mid-height material (or mid-root in root cuttings of *P. tremula*) disappeared in "secondary" material (i.e. cuttings from the original rooted cuttings) whose responses were generally better and more uniform. In many hardwoods, epicormic scions grew better if from the upper stem, and branch scions if from the lower crown, but it is suggested that this may be a physiological effect (shading) rather than a topophysical one. In Spruce, there was no difference between branches from the upper or lower crown; cuttings and scions from higher branch orders, however, took better than those from lower orders or terminals, but grew less fast. Differences in material from trees of different age disappeared in secondary material. Hardwoods generally developed normal growth habit unaided, or after cutting back etc., in ≯3 years. Poplars grown, with the help of growth regulators, from leaves or parts of leaves, developed normal habit. Pine, and often Larch, soon developed normal, i.e. orthotropic, radial, growth, but Spruce, Douglas Fir and Silver Fir retained their branch habit for a considerable time. In Spruce, the time taken to develop normal habit was related to branch order. Within each branch order, material from younger trees made the transition faster than materials from older trees. With all hardwoods, and some conifers, any effects of topophysis and cyclophysis (the development stage which the propagated part has reached in the life cycle) are thought to be short-lived and easily overcome by simple techniques, so that vegetatively propagated material can safely be used for comparative tests.

4422. KOMISSAROV, D. A. Ob otbore drevesnyh rastenij na sposobnost′ k čerenkovaniju i značenii povtornogo razmnoženija rastenij iz čerenkov. **[Selection of woody plants for rooting capacity of cuttings, and the importance of repeated propagation by cuttings.]** *Agrobiologija* 1960 (5), (766–8). 9 refs. [Russ.] I.M.I.

Discusses experiments with *Quercus suber* and *Cupressus arizonica* showing that cuttings from different trees of the same species vary in rooting capacity. Experiments were also made with *Q. suber*, *C. arizonica* and *Metasequoia glyptostroboides* on repeated propagation by cuttings. Cuttings taken from 1-year seedlings or, in *C. arizonica*, from 2-year seedlings, were rooted (first vegetative generation—v.g.); cuttings taken from these in the following year were again rooted (second v.g.), and the same process was repeated once more (third v.g.). It was found that rooting capacity fell in succeeding v.g.'s, particularly in *Q. suber*, but in second- and third-v.g. cuttings it exceeded that of cuttings from normal 2- and 3-year-old (in *C. arizonica*, 3- and 4-year-old) seedlings used for comparison. [Cf. *F.A.* 19 No. 1673.]

4423. CLAUSEN, K. E., and KRAUS, J. F. **Air-layering of Birch**. *Minn. For. Note* No. 102, 1961. pp. 2. 1 ref.

Air-layering was carried out in June on 5 branches of *Betula papyrifera*, 6 of *B. pumila* var. *glandulifera*, and 9 of natural hybrids between them. A small amount of 1% IBA in talc was applied in sphagnum to each branch treated, before covering with moist sphagnum, polythene sheet, and a loose wrapping of aluminium foil. Examination of several branches after 3 weeks showed that they had formed only callus. After 7 weeks, the branches were cut off, and potted with the sphagnum intact after removal of the plastic sheet. At time of removal from the parents, 14 of the 20 had roots and 5 had callus. After 2 months in the greenhouse, with regular watering, only 57% of the rooted and potted air-layers had survived. [Cf. *F.A.* 20 No. 3107.]

4424. GUINAUDEAU, J. Note sur les procédés de greffage du pin maritime. **[Methods of grafting *Pinus pinaster*.]** *Rev. for. franç.* 13 (3), 1961 (153–60). [F.]

Gives the results of a number of experiments, using different methods of grafting, in the open and on pot plants in cold frames. It is concluded that success depends in the first place on the skill of the grafter. Scions should be taken from the upper part of the crown and stocks should be potted at least a year before grafting. There is a great difference in success with scions from different individuals, and it is recommended that they should be taken from trees of proved grafting ability. Open-air grafting is less successful than that in frames. In the latter case, double-glass is advisable, so as to maintain high humidity, and the frames should be shaded by straw mats. The actual form of graft seems relatively unimportant.

4425. HARDJONO, DJODJO, and LOEKITO, D. Pertjobaan okulasi djati (*Tectona grandis* L.F.). **[Budding experiment on Teak.]** *Commun. For. Res. Inst., Bogor* No. 68, 1959. pp. 29. 8 refs. [Indon. indon.e.]

Results of experiments at Saradan with local material and at Kesamben with Malabar Teak are discussed. The budding method is described and illustrated. Success was related to the age of the mother tree from which scions were taken, with mean figures of 70% successful buddings from those 20–50 years old and of 60% for older trees. [Cf. *F.A.* 22 No. 461.]

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also Nos. 4069–71, 4382.

4426. HETH, D. **Nursery techniques for Eucalypts. III. Production of balled stock in receptacles**. *Leafl. Dep. For. Israel* No. 16, 1961. pp. 6. 3 refs. [E.]

[Cf. *F.A.* 20 No. 443; 22 No. 3025.] Data on dry weight of aerial parts and roots of transplants of *Eucalyptus rostrata* and *E. gomphocephala* grown in pots, bags etc. of varying materials and size, during tests from 1956 to 1960, are tabulated. Best results were obtained in individual earthenware pots, but individual concrete and asbestos cement pots, peat pots, and plastic bags also gave good results. Soil volume and depth appeared to be more important than container material. Growth in rubber pots was poor, possibly because they contained too little soil. Plastic tubes 30 cm. long and 7 cm. in diam. [cf. *F.A.* 18 No. 2778] produced less top growth but strong tap roots. The most suitable shoot/root ratio is estimated at 1·5 for *E. rostrata*, and 2·0 for *E. gomphocephala*.

232.33. Formation of Stands by Direct Sowing

See also Nos. 4328, 4364.

4427. GAUSSEN, H. À propos du cyprès des Ajjers—son intérêt forestier. **[The forestry interest of *Cupressus dupreziana*.]** *Rev. for. franç.* 13 (2), 1961 (98–102). [F.]

Notes on a few successful experiments in raising this species from seed, e.g. at Toulouse. [Cf. *F.A.* 22 No. 4156.]

4428. HORTON, K. W., and MCCORMACK, R. J. **Economical spot seeding and planting methods for Pines on sand plains.** *Tech. Note Dep. For. Can. Lab.* No. 100, 1961. pp. 19. [E.e.f.]

Presents results of an experiment made in E. Ontario in 1954 to compare 5 economical spot-sowing and planting methods of regenerating Pines on sandy outwash sites in contrasting open-heath and Aspen-covered areas. Planting of 2 + 0 stock of *Pinus strobus*, *P. resinosa*, *P. banksiana* and *P. sylvestris* proved best, giving high survival rates; planting of 1 + 0 stock was promising for *P. sylvestris*. Three spot-sowing methods tested were generally unsuccessful, although deep sowing (¼ in.) on small scarified plots showed some promise under a light Aspen canopy. *P. banksiana* showed the best height growth, both in openings and under cover, but growth of *P. strobus* and *P. resinosa* was discouraging. Seasonal weather influenced the results, with an exceptionally dry season greatly reducing survival. This effect was modified under the Aspen cover, the dryness apparently delaying germination, particularly of *P. strobus* seed. There were no significant differences between comparable spring and autumn trials. Treatment of seed with red lead [rodent- and bird-repellent], improved the germination % at little cost. *From authors' summary.*

4429. **Seeding project on Louisiana lands sets record**. *Timberman* 62 (3), 1961 (34–7).

Describes company operations to reforest 92,000 acres by means of tractor-towed disk cultivators incorporating seed drills and tamping wheels. The two seed hoppers are divided so as to allow, in one run, the alternation of 2 species at 12-inch intervals in 2 rows 8 ft. apart. One tractor sows ca. 30 acres in 8 hours. Sowing from aeroplanes and helicopters proved faster but lack of rows and greater seed requirement (one lb. against ⅓ lb./acre) ruled this out. The direct-sown seed is treated with repellents (15 lb. Arasan + 2 lb. Endrin W/100 lb. seed). Loblolly, Slash, and Longleaf Pine seed are used, the first stratified for 30–60 days.

4430. BALDWIN, H. I. **Direct seeding White Pine**. *Fox For. Note* No. 77, 1960. pp. 1. 2 refs.

Spots sown with *Pinus strobus* seed in 1955 [see *F.A.* 18 No. 2785] were subsequently invaded by competing vegetation, so that by 1959 very few Pine seedlings survived. When 55 more spots were sown at 10 seeds per spot in 1956, alternate spots were protected with conical screens. After 3 years, 24% of screened spots, but no open spots, had one or more seedlings. Open spots were smothered initially by hardwood leaves, and later mortality was caused by invasion from other vegetation. In November 1958 an abandoned pasture was sown with 193 spots, 63 of them screened, and 9 covered with 1 × 1 ft. cylinders of 1-in. wire netting. After one year, 33% of spots with wire cages, 54% of spots with screens and 10% of unprotected spots were stocked. Unprotected spots were invariably filled with leaves.

4431. ŽETKO, A. Uspjele ručne sjetve crnog bora na Kršu. **[Successful hand sowing of *Pinus nigra* in the Karst region.]** *Šum. List* 84 (11/12), 1960 (379–82). [Croat.]

Direct broadcast sowing by hand on the *Seslerieto autumnalis–Ostryetum carpinifoliae* of the Slovenian Karst, with no ground preparation, has produced excellent results. The first trial plot of 1 ha., sown in 1952 with 4 kg. of seed, had 45,000 Pines (height 1·4 m.) in 1960. Some 360 ha. have been sown since, mostly with success. Sowing should be done in February or early March, and requires 3–4 kg. seed and 4–8 man-hours/ha. The method is best suited to sites with a N.E., N. or E. aspect, at 400–800 m. alt. [Cf. *F.A.* 22 No. 3041.]

4432. Karaçam yanık orman sahalarında ağaçlandırma tekniği üzerinde denemeler. **[Studies on afforestation techniques on burnt-over *Pinus nigra* forests.]** *Extr.* from *Orm. Araşt. Enst. Yıl. Bült.* No. 7, 1958 (7, 38). [Turk.e.]

In experiments started in 1957, early spring plantings gave higher first-year survival than later ones. Survival from planting was higher than that from direct sowing; results with 1 + 0 and 2 + 0 plants were equally good. Slit planting was as satisfactory as hole planting.

4433. JUNACK, [H.]. Alte und neue Kulturmethoden der Kiefer und ihrer Mischhölze in wirtschaftlicher Prüfung. **[Old and new methods of planting and sowing Pine and species mixed with it, considered economically.]** *Forsttech. Inform., Mainz* 1961 (4), (25–30). [G.]

Chiefly describes and discusses, with special reference to labour and costs, experience at Gartow [Lower Saxony] with: (*a*) Broadcast sowing in ploughed furrows (still considered best for dry or moderately fresh sands), planting with supplementary sowing, and ball planting (all for Scots Pine), and planting of bare-rooted Scots Pine, Norway Spruce and *Pinus strobus* after herbicide treatment on *Molinia* and *Vaccinium* sites (both rated about the same). (*b*) Planting of Norway and Sitka Spruce, Douglas Fir and *Pinus strobus* without soil preparation, with a concave spade, in the semi-shade of partly devastated stands, to supplement natural Pine regeneration; this method is considered highly successful and economic.

4434. NABATOV, N. M. Sravnitel'naja ėffektivnost' posevov i posadok sosny. **[Comparative effectiveness of sowings and plantings of Scots Pine.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (42–52). [Russ.]

Compares planting with direct sowing in ploughed furrows on *Pinetum vacciniosum* sites in the Gor'kiy region (S. taiga zone and the N. coniferous/broad-leaved forest zone). There was little difference in survival, growth and yield between planting and sowing, and sowing required less labour. On old clear fellings with *Calamagrostis*, and on fellings on richer soils, survival from sowing is less than from planting, because of competition from the herbaceous vegetation.

4435. PENTIN, A. P. Centralizovannaja organizacija rabot po aėrosevu. **[Centralized organization of aerial sowing.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (24–32). [Russ.]

Describes the practice followed since 1954 in the Gor'kiy region, where aerial sowing is done on the snow in winter, from central aerodromes each covering an area of ca. 60 km. radius. This frees most leskhozes from the burden of setting up landing fields, and allows economic sowing of small areas (even <25 ha.). The organization and techniques of the actual sowing operation are described.

4436. Vojčal′, P. I. K metodike učeta kul′tur proizvedennyh aërosevom. **[On a method of enumerating stands produced by aerial sowing.]** *Lesn. Ž., Arhangel′sk* 2 (4), 1959 (35–9). [Russ.]

Discusses several examples of the distribution and numbers of seedlings from aerial sowings in the Archangel area. It is concluded that the most accurate way of enumerating such stands is not by establishing sample plots, but by strip sampling, broken down according to previously defined divisions for growth conditions and types of felling area. In the early years, when there are very large numbers of seedlings, it is possible to use separate plots, but they should be fairly closely spaced.

4437. Sysoev, E. P. Nekotorye puti povyšenija rezul′tatov aëroseva v Kirovskoj oblasti. **[Some ways of improving the results of aerial sowing in the Kirov region.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (33–41). [Russ. russ.]

Makes general recommendations on the best time to sow Scots Pine and Norway Spruce, and the site types most suitable for aerial sowing.

4438. Eršov, L. A. K voprosu o srokah poseva semjan sosny. **[On the times to sow Scots Pine seed.]** *Lesn. Ž., Arhangel′sk* 2 (5), 1959 (170–1). [Russ.]

From trials of direct sowing of clear-felled areas in the Archangel region, covering only 1957–58, concludes that the best time to sow in prepared soil is from the snow-melt to 15–20 June. July is highly unsuitable, and seeds sown in August or later do not germinate till the following year.

4439. Lazarević, Z., Korać, M., and Gajić, M. Izvesna zapažanja pri primeni nekih načina setve kod kiselog drveta (*Ailanthus glandulosa* Desf.). **[Observations on the use of certain sowing methods with *A. altissima*.]** *Šumarstvo* 14 (1/2), 1961 (15–23). 13 refs. [Serb.f.]

As part of a project at the Forestry Faculty, Belgrade, to determine the mutual relations of individual plants following certain sowing methods, a series of tests was carried out on *A. altissima*. Seeds were sown in nests of (*a*) 10, (*b*) 20, and (*c*) 30 seeds on 3 plots of 9 sq. m. (36 nests per plot, 0·5 m. apart). A fourth plot (*d*) of 9 sq. m. was sown in 6 rows 0·5 m. apart and 3 m. long, at 100 seeds/m. of row. After one growing season, the plant % was 51 for (*a*), 63 for (*b*), 48 for (*c*) and 42 for (*d*). Excavations showed natural root grafts (described and illustrated) in 2 out of 7 nests in (*a*), 2 out of 7 in (*b*), 6 out of 8 in (*c*), but none in the rows in (*d*). Sowing method and density also affected seedling size. Mean height was greatest in (*b*), followed by (*a*), (*c*), and (*d*) in that order; mean diameter was greatest in (*a*), then (*b*), (*c*), and (*d*). [Cf. *F.A.* 17 No. 231.]

4440. Mathur, C. M. **Artificial regeneration of *Santalum album* in Rajasthan.** *Indian For.* 87 (1), 1961 (37–9).

Satisfactory establishment was obtained by sowing *S. album* seed of Mysore origin in patches ca. 1 ft. in diam. cultivated to a depth of 3 in., beneath bushes of *Carissa opaca*, the usual host plant in this region. Watering made no significant difference to height growth.

4441. Burns, R. M. **Seed sowing tool.** *Tree Plant. Notes* No. 45, 1961 (3–4).

Describes, with diagrams and photo, a hand tool for spot sowing of Pine seeds, developed and tested in N. Mississippi. It has a rake at the lower end for baring mineral soil, and the hollow handle contains a metering device for dispensing seed. It is all metal, weighs 4½ lb., and holds a day's supply of seed.

232.4. Formation of Stands by Planting

See also Nos. 4157, 4321–3, 4328, 4332, 4363, 4428, 4432–4.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 4398, 4400.

4442. Mullin, R. E. **An experiment on culling and grading of White Spruce nursery stock. Part A. The percentage of cull.** *Res. Rep. Ont. Dep. Lds. For.* No. 38, 1959. pp. 62. 54 refs.

A 3-year study of % of cull of 2 + 2 stock showed great variability within lifting crews, between crews, between nurseries, and between years. In every instance, lifting crews were able to distinguish two classes of stock, cull having a lower capacity for survival than acceptable. There were significant differences in survival between cull and acceptable stock of the three nurseries, which changed in order and magnitude on the two planting sites—implying interactions between survival capacities of the stock and the properties of the planting sites. Culling was increasing the survival of the shipping stock by only about 3·1% over that which would have been attained by nursery-run or non-culled stock. Pending better culling and grading standards which might be revealed by later growth records, it is suggested that control of stock quality should be sought by other methods, e.g. by laboratory testing and field test plantings. *From author's summary.*

4443. Harvey, G. M. **Effects of refrigeration and shipping on Sugar Pine field survival.** *Tree Plant. Notes* No. 45, 1961 (17).

The study reported was designed to test for significant difference in survival between refrigerated and freshly lifted seedlings dispatched from the nursery 2 weeks, 1 week, and the day before planting. The variation between transit periods was not significant, but that between stored and freshly lifted seedlings was highly significant (1% level). The results support the nursery practice of dispatching freshly lifted *Pinus lambertiana* seedlings.

4444. Kahler, L. H., and Gilmore, A. R. **Field survival of cold stored Loblolly Pine seedlings.** *Tree Plant. Notes* No. 45, 1961 (15–6).

Under the conditions of this experiment it was found that Loblolly Pine seedlings cannot survive cold storage unless they are hardened off and dormant before storage begins. Survival was influenced by the physiological condition of the seedling, not by storage conditions. In S. Illinois, Loblolly Pine should probably not be lifted, during normal years, before the middle of Dec. for placing in cold storage for spring planting.

4445. URSIC, S. J. **Pit storage of baled Loblolly seedlings.** *Tree Plant. Notes* No. 45, 1961 (13–4).

In N. Mississippi a study comparing methods of storing baled Loblolly Pine seedlings has indicated that storage in earth pits is as effective as the rack and cold storage methods recommended earlier [cf. *F.A.* 18 No. 1566].

4446. GERGELY, P. Erdei- es feketefenyö csemeték téli vermelése. **[The winter heeling in of Scots and Austrian Pine.]** *Erdö* 10 (1), 1961 (21–3 + smries. in suppl.). [Hu.g.russ.]

From experimental evidence and meteorological data, recommends that the soil be friable and moist, the plants spread in a thin layer, covered with 7–8 cm. of soil and firmed with the foot. The plants must be covered against frost, the cover being immediately removed when the danger is past.

4447. DARBY, S. P. **Georgia's "Wraparound" seedling crate.** *Tree Plant. Notes* No. 45, 1961 (7–9).

Describes, with photos and specifications, a demountable crate in use in Georgia for baling planting stock, of veneer and wirebound construction. The crates are re-usable, and packing is much more rapid than with the conventional paper and steel tape.

4448. THAMES, J. L. **Effects of wax coatings on leaf temperatures and field survival of *Pinus taeda* seedlings.** *Plant Physiol.* 36 (2), 1961 (180–2). 13 refs. O.R.E.

Survival of seedlings planted on a sandy soil in Mississippi was reduced when a wax transpiration-retardant was applied once, in late June, and was greatly reduced when the treatment was repeated several times during the summer. Height growth was unaffected. Laboratory studies showed that, under radiant heat, the temperature of waxed leaves rose an average of 4·4° F. above that of normal leaves. Rates of heat absorption were also considerably greater for waxed leaves. The amount of water available for transpiration had no apparent effect on leaf temperature. The mortality of treated seedlings is attributed to an unfavourable upset of the heat balance between leaves and atmosphere under high insolation. *From author's summary.*

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 4461, 4479, 4483.

4449. BARNER, J. Biologische Analyse verschiedener Pflanzverfahren. **[Biological analysis of different planting methods.]** *Forstarchiv* 32 (3), 1961 (50–2). [G.]

Comparisons were made of the growth during one growing season of 2-year Douglas Fir nursery stock planted by two methods (angle or hole planting [cf. *F.A.* 20 No. 3121]) on each of three hydrologically controlled plots on clay soils, (1) moist, (2) dry, and (3) wet. Data are presented on height growth, dry weight production, shoot/root weight ratio and phenology.

4450. STÅÅL, E., and FRANZON, Y. Plantering i grönt ris på nya hyggen. **[Planting in fresh slash on recent clear fellings.]** *Skogen* 48 (7), 1961 (134). [Sw.]

The method gave good results in a dry part of S. Sweden, particularly in dry years, for Spruce plants previously dipped in DDT against *Hylobius* attack. Planting costs were 6 öre/plant against 5 on old clear fellings, and costs for clearing or burning slash, ground preparation and weeding were saved.

4451. **[Mechanized planting.]** *Suppl.* to *Forst u. Jagd* 11 (4), 1961. pp. 7. 13 refs. [G.] (*Technik und Technologie in der Forstwirtschaft*, No. 1.)

Includes an article by *H. Robel*, describing and comparing various E. and W. German and Russian planting machines, and one by *W. Lechner*, reporting on practical experience with the W. German "Accord" machine for planting mixtures on ploughed sites [cf. *F.A.* 18 No. 4015].

4452. STAREK, E. Mechanická príprava pôdy prenosnými jamkovačmi pri zalesňovaní. **[Mechanized soil preparation for afforestation, with portable plant-hole borers.]** *Lesn. Čas.* 7 (2), 1961 (98–105). [Slovak.russ.g.]

Compares several portable plant-hole borers manufactured in Czechoslovakia, and investigates the strain of operating them. Their use increases labour productivity, and the work is easier than hand labour. Calorie consumption varied from 3·5 to 7·3/min. in working with them.

232.43. Spacing and Arrangement in Plantations

See also Nos. 4163, 5205.

4453. PETROV, N. M. Rost listvennicy i sosny v gruppovyh i ediničnyh posadkah. **[The growth of *Larix sibirica* and *Pinus sylvestris* planted singly and in groups.]** *Lesn. Hoz.* 12 (12), 1959 (37–41). [Russ.]

Two-year seedlings were planted out in spring 1949 in the Arzamas arboretum, (1) singly, and (2) in groups. For (1), patches 0·7 × 0·7 m. were prepared 1·5 × 1·5 m. apart (between centres); for (2), patches 1 × 1 m., 2 × 1·5 m. apart. The soil was a fresh, soddy, slightly podzolic, clay-loam. In (1), seedlings were planted one per patch, and in (2) Larch were at 2, 3, 4 . . . 21 and Pine at 2, 3, 4 . . . 10 per patch. Survival of both species after 1 and 2 growing seasons was $\geqslant 90\%$ in both (1) and (2). Height increment data are given for the years 1951–58, and diameter data (at 1 m. height) for 1956–58. Results show that in the first few years (up to 1952), the mean height and c.a.i. were greater in the denser plantings, but this difference evened out, and by 1958 the single plants were as big as, or bigger than, the others and their height c.a.i. was greater. The bearing of these findings on plantation establishment is discussed.

4454. SMIRNOV, N. T. Sostojanie kul′tur sosny v zavisimosti ot razmeščenija rastenij i gustoty posadki. **[The condition of Scots Pine plantations in relation to the arrangement of the plants and**

planting density.] *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (53–9). [Russ.]

In 1949 in the Saratov region 1-year Scots Pine was planted in rows at 1·25 × 0·75 m. (*a*), and in 2 × 1 m. patches at rates of 20, 50, 100 and 200 plants/patch with 200 patches/ha. (*b*), or 20 plants/patch and 625 patches/ha. (*c*). Diameter increment and crown development at 7 years were clearly best on (*a*), which was also the most economical method. Where, e.g. stumps have not been removed, or existing young stands require beeting up, and patch planting is resorted to, (*c*) is the best method.

4455. TADAKI, Y., and SHIDEI, T. **[Studies on the competition of forest trees. (II.) The thinning experiment on small model stand of Sugi (*Cryptomeria japonica*) seedlings.]** *J. Jap. For. Soc.* 41 (9), 1959 (341–9). 9 refs. [Jap.jap.e.*e*.]

[Cf. *F.A.* 22 No. 3058.] To study the effect on total volume production of thinning a small model *C. japonica* stand, 5 experimental plots each of 5 blocks, in which 100 seedlings/sq. m. were planted, were established in April 1956 on the Latin-square method and treated as follows: (1) unthinned controls; (2) pruning part of the live crown to avoid contact with neighbouring seedlings; (3) repeated thinning of suppressed individuals; (4) repeated thinning of dominants; (5) mechanical thinning of 50% of the seedlings at an early stage of the experiment. By September 1958 each treatment had been made 5 times, and the green weight of stems calculated by measuring the basal diameter and height of the seedlings. In December 1958 all seedlings were dug up and measured. The results showed that the total stem yields per unit area (including yields of thinnings) were greatest for (1) and (3); mean stem weight was greatest for (3) and (5). For (5) the total production after thinning was no greater than for (1) or for lightly thinned plots, because of the interruption of the canopy.

232.44. Season and Time of Planting

4456. WALTERS, J., and SOOS, J. **The effect of month of planting upon survival and growth of Douglas-Fir and Scots Pine seedlings.** *Res. Pap. Fac. For. Univ. B.C.* No. 38, 1961. pp. 12. 13 refs.

A study was made to test the possibility of extending the planting season, e.g. by beginning earlier in the autumn and going on later in the spring. Results are discussed in terms of mortality and height growth of seedlings planted throughout the growing season. With favourable weather and strict adherence to certain principles, the planting period could be extended without restricting growth or survival.

233. Afforestation

See also Nos. 4254, 4431–2, 4482, 4950, 5309–10.

4457. STEWART, G. G., and DODDS, J. W. **Buck Fell: a pioneer hill plantation in Northumberland.** *Quart. J. For.* 55 (2), 1961 (139–45). 3 refs.

Describes and gives the history of a *Picea abies* wood, 70–80 years old, on poor soil at a high elevation. At 1125 ft. alt., planted with drains 2 ft. deep at half-chain intervals and with a shallow drain at half this spacing, *P. abies* has grown slowly but steadily, reaching a height of ca. 45 ft. in 75 years. The total yield after ca. 65 years was 2500 H. ft./acre. At ca. 1050 ft. alt., the yield is estimated to have been much greater, approximating to quality class IV. Stem analysis of one dominant indicated that c.a.i. reached its maximum at 65, and m.a.i. at 75 years. No thinning was done. Windblow, attributed to lack of drain maintenance, began at ca. 50 years, and by 75 years little of the crop was still standing. Individual *Abies alba* in the plantation grew taller and produced a larger volume than *P. abies*.

4458. DALMADY, J. Zalesňovanie krasových holín na Slovensku. **[Afforestation of karst areas in Slovakia.]** *Ved. Práce Výskum. Úst. Lesn. Hosp. Bansk. Štiav.* No. 1, 1960 (41–67). 21 refs. [Slovak. slovak.russ.g.]

An account of research and trials.

4459. HART, G., and BYRNES, W. R. **Trees for strip-mined lands.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 136, 1960. pp. 36. 5 refs.

In summer 1958, survival and growth were determined in 22 experimental plantings made in 1946–49 to determine the species best adapted to strip-mined lands in the bituminous region of Pennsylvania. Hybrid Poplars (*Populus maximowiczii* × *P. trichocarpa* or *P. maximowiczii* × *P. berolinensis*), *Robinia pseudoacacia*, *Quercus borealis*, *Larix leptolepis*, and *Pinus banksiana* showed best survival and growth. *Pinus sylvestris* did very well, but has not been widely tested. *Fraxinus pennsylvanica*, *F. americana*, *Pinus rigida*, *P. resinosa*, and *P. strobus* were more variable, and do not appear suitable for such sites. The Pines proved susceptible to insect damage, and both Ashes were severely attacked by *Lepidosaphes ulmi*. *Larix decidua*, *Pseudotsuga taxifolia*, *Picea glauca*, *Pinus ponderosa*, and *Juglans nigra* showed poor growth and survival, and are not recommended. The shrubs *Pyrus melanocarpa*, *Viburnum dentatum*, *Cornus obliqua* and *Corylus americana* survived and developed well. [Cf. *F.A.* 13 No. 3812.]

4460. CURLIN, J. W., and MCDERMID, R. W. **Reclamation of timberlands damaged by oilfield waste.** *J. For.* 59 (3), 1961 (171–4). 9 refs.

The nature of oil-field effluent, the amount retained in the soil, the tolerance to it of *Pinus taeda*, and the possibility of rehabilitating land where all trees had been killed, were studied on level, salt-damaged forest land in three oil-producing areas in S.E. Texas. The soils, characterized by a compacted or slightly cemented silty clay or sandy clay fragipan at 6–24 in. depth, showed very poor permeability. Analysis of samples from damaged areas showed concentrations of 0·74–3·3% total mineral salt by weight, even after years of exposure to atmospheric conditions. Much of this was NaCl. Analysis of water from adjacent oil wells showed the same salts in the same proportions. The minimum lethal concentration of NaCl for 1-year *P. taeda* seedlings was found to lie between 4575 and 7131 p.p.m.; that for germination was between 4575 and 9740 p.p.m. To improve drainage and permit leaching of the soluble salts, the use of mole ploughs laying plastic drains is suggested. Hypothetical costs for a first rotation of *P. taeda*, allowing 5 years for rehabilitation after drainage, indicate that a small profit would be made.

4461. IL'KUN, G. M. Vplyv torfuvannja pisku na rozvytok korinnja sosni v glybynu. **[Effect of the addition of peat to sand, on the depth of Scots Pine roots.]** *Dopovidi Akademiji Nauk Ukrajins'koji RSR* 1959 (8), (908–11). 7 refs. [Ukr. russ.e.] N.L.L.

Reports pot experiments confirming the efficacy of adding peat to aeolian sands [cf. *F.A.* 16 No. 1707]. Scots Pine roots were longer, went deeper, and could penetrate denser sands, when peat was added.

4462. GVOZDIKOV, A. V. Rezul'tativnost' lesokul'turnyh rabot v peskah Srednej Azii. **[Effectiveness of plantation work in the sands of Central Asia.]** *Lesn. Hoz.* 13 (12), 1960 (32–5). [Russ.]

In Uzbekistan, 146,500 ha. of plantations were established on sands in 1924–53, of which 52% survived; 260,000 ha. were established in 1953–58, of which only 6·4% survived. The plantations are mainly *Haloxylon* spp. The reasons for the poor results in the second period are thought to be: (1) the recent advocacy of broadcast sowing (mainly aerial), with almost complete disregard for the careful planting, protection against wind and shifting sands, and raising of sound nursery stock, that had been practised earlier; and (2) sowing at the wrong time (winter).

4463. VYAS, R. C. **Soil conservation and afforestation in the Chambal ravine [,Madhya Pradesh].** *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (274–81). 9 refs.

Summarizes soil-conservation measures carried out and proposed, to prevent further gully-erosion in this area.

234. Formation of Forest by Natural Succession

See also Nos. 4245, 4635.

4464. YOUNGE, O. R., and MOOMAW, J. C. **Revegetation of stripmined bauxite lands in Hawaii.** *Econ. Bot.* 14 (4), 1960 (316–30). 37 refs.

Notes on succession back to forest and on revegetating with herbaceous plants.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 4020, 4314, 4332, 4433, 4440, 4473, 5305.

4465. RED'KO, G. I. Vplyv čornoji vil'hy (*Alnus glutinosa* Gaertn.) na produktyvnistj kanads'koji topoli (*Populus canadensis* Mnch.). **[Effects of *A. glutinosa* on the yield of *P.* × *canadensis*.]** *Dopovidi Akademiji Nauk Ukrajins'koji RSR* 1958 (1), (343–6). 1 ref. [Ukr.russ.e.] N.L.L.

Investigations in *P.* × *canadensis* plantations 9–30 years old in the Ukrainian forest-steppe region, revealed that yields increased with increasing proximity to *A. glutinosa* stands, because of the N-fixing capacity of the latter. Diameter increase was more striking than height increase. Some data are tabulated.

4466. TÓTH, B. Nižnie jarusy lesov na zasolonennyh počvah ("sikah"). **[The understoreys of forests growing on alkaline ("szik") soils.]** *Acta Agronomica Academiae Scientiarum Hungaricae, Budapest* 9 (1/2), 1959 (41–60). 6 refs. [Russ.g.e.] A.P.B.

Based on observations in various parts of Hungary, suggestions are made for species (including exotics) suitable as understoreys and shrub layers on (*a*) the moist and fertile forest types, (*b*) the drier and poorer types carrying Oak stands, and (*c*) the driest, poorest, types carrying *Elaeagnus angustifolia*. *From author's summary.*

4467. ZMIJANAC, Đ. Neke smjernice za plantažni uzgoj šumskog drveća. **[Some directions for raising forest trees in plantations.]** *Šum. List* 84 (11/12), 1960 (371–8). [Croat.e.]

Describes, with diagrams, a method in which N.–S. rows are set 7 m. apart, with plants at 1-m. intervals in the row, as follows: Plane, 3 Spruce, Poplar, 3 Spruce, etc. The rows are intercropped for 6 years with agricultural crops, then the Spruces adjacent to each Poplar and Plane (i.e. two Spruces out of the three) are transplanted to form another row between the original rows, all plants at 2-m. intervals. The Poplars are cut at 12 years, the Planes at 15, and their coppice regrowth again at 25 and 30 respectively. Only Spruce would then be left, to be cut at 40 years. This method gives 5 cuts in 40 years and a theoretical annual volume increment of 55·8 cu. m./ha.

4468. STĂNESCU, C. Nucul comun (*Juglans regia* L.) în regiunea Ploieşti. **[*J. regia* in the Ploeşti district of Rumania.]** *Rev. Pădurilor* 75 (7), 1960 (403–8). 5 refs. [Rum.russ.g.e.f.]

Describes the natural occurrence of the species, and successful experiments in planting it in mixture with Poplar, Oak, and other hardwoods. It is concluded that it may be grown successfully as a forest tree in this region, at altitudes of 200–500 m. according to the aspect of the site.

4469. AGRAWAL, S. C., CHINNAMANI, S., and REGE, N. D. **Mixed plantation for effective soil conservation in the Nilgiris.** *Indian For.* 87 (1), 1961 (26–33 + 1 dgm., 2 photos). 3 refs.

Eucalyptus globulus, even when planted as close as 6 × 6 ft., does not control erosion, partly because the crowns are usually lopped and the litter collected for extraction of the essential oil. But it has been observed that *Acacia mollissima* (which is also inadequate alone) comes in naturally under the Eucalypts and thrives well, and such a mixture should be economic as well as having much greater protective value than either species alone.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also Nos. 4163, 4292, 4303, 4326, 4417–8, 4436, 4673–4.

4470. Zima, I. M., and Maljugin, T. T. Mehanizirovat′ uhod za počvoj v rjadah lesnyh kul′tur. **[Mechanization of scarifying and weeding within the rows in plantations.]** *Lesn. Hoz.* 13 (11), 1960 (63–4). 1 ref. [Russ.]

Describes an implement developed for scarifying and weeding in vineyards between the vines in a row, and its use in Crimean forest plantations aged ⩾2 years. Similar to tools already described [cf. *F.A.* 22 No. 1812], the implement has rotating blade-wheels that loosen the soil and destroy weeds between the individual trees in the row, and a spring-loaded safety device preventing damage to the young trees.

4471. Goor, C. P. van, and Jager, K. Bestrijding van grassen in bosculturen met dalapon (DCP). **[Control of grass in plantations with dalapon.]** *Ned. Bosb. Tijdschr.* 33 (2), 1961 (48–52). 2 refs. [Du.g.e.]

Presents a summary of results (to be published in detail elsewhere) on the susceptibility of various grasses and of young conifers of different species to dalapon applied before and after planting, and recommends spraying at the rate of 7½–10 kg. in 500 litres water/ha. between 15 March and 15 April. Seedlings <2 years old should not be sprayed.

4472. Høje, K. L. Bekjempelse av lauvkratt og gras på plantefelt. **[Control of hardwoods and grass on planting sites.]** *Norsk Skogbr.* 7 (5; 6), 1961 (170–3; 233–6). [Nor.]

Summarizes results of test series by the Weed Section of the Norwegian Plant Protection organization, using CMPA, 2,4-D and 2,4,5-T alone or in various combinations against woody species, and dalapon, TCA, simazine and amino-triazole and combinations of these against grasses, including also costs and labour requirements. Simazine was the most effective against surface-rooting grasses. In one test, Spruce on plots that received simazine alone (1 kg./0·1 ha.) showed greater leader growth than on plots simultaneously sprayed and fertilized.

4473. Parascan, D., and Vlase, I. Încercări de combatere a buruienilor din plantaţiile de foioase cu ajutorul ierbicidelor. **[Chemical control of weeds in broadleaved plantations.]** *Rev. Pădurilor* 75 (12), 1960 (729–34). 10 refs. [Rum.russ.g.f.e.]

In the course of converting an unproductive Hornbeam stand to more productive mixed hardwoods by clearing strips 20–40 m. wide and planting them with 1-year seedlings of *Quercus robur*, *Q. sessiliflora*, *Fraxinus excelsior* and *Cornus sanguinea*, it was found necessary to control the herbaceous weeds that threatened to smother the young trees. Experiments were made with 2,4-D, 2,4,5-T, Agroxon, Monasan and simazine in concentrations of 1, 2, and 3‰ applied at the end of June. All treatments gave satisfactory control (number of weeds reduced by ⅔ and number of weed species by ¼–½ by the end of the growing season). Data on the susceptibility of a number of weed species and of broadleaved tree species are tabulated. The most effective treatment, and least injurious to the tree species, was simazine at all concentrations, but 2,4-D at 3 ‰ concentration was also very satisfactory and (in Rumania) much cheaper.

4474. Fröhlich, H.-J. Jungwuchspflege und Läuterung mit synthetischen Wuchsstoffen. **[Tending young growth and cleaning with synthetic growth regulators.]** *Mitt. Hess. Landesforstverw.* No. 3, 1961. pp. 56. 29 refs. [G.g.]

Describes experiences and field tests with Tormona 100 (2,4,5-T) in Hesse, and experiments on its mode of action. In very dense natural regeneration of Spruce (nearly one million plants/ha., 30–90 cm. high at a mean age of 11 years in places), spraying swaths 1–1·50 m. wide, spaced 1·50–2 m. apart, led to rapid differentiating growth in the remaining trees, which closed the gaps in 3–6 years. Two litres of Tormona in 100 litres of diesel oil, at a cost of DM. 133/ha., including labour, were required. Death of treated trees occurred earlier or later according to the amount of foliage wetted, those with ⩾50% wetted dying within one growing season. Hence no rapid increase of dead or dying trees, which might attract barkbeetles, occurred. In hardwood thickets, the fact that poisoned trees continued to provide support against snow or wind pressure was found to be an advantage over mechanical cleaning. Both spraying and brushing (ineffective on conifers) could be used here; in general, thin coats of a 3% solution, ca. 50–60 cm. long and covering 30–50% of the circumference, sufficed. Dyeing to facilitate inspection is recommended for both spray and brush treatments. For shrubs, coppice shoots, etc., wetting with gloves having palms of plastic sponge proved effective. Treatments could be applied on most species all the year round. A table of recommended dosages, methods, and timing, for various species, and a table of labour requirements and costs in Beech stands of various ages up to the young pole stage are presented. Laboratory tests with Spruce, Birch, and Alder demonstrated the accelerating effect on respiration and transpiration, leading rapidly to exhaustion, particularly with foliage sprays; transpiration in Birch twigs, measured by potometer, was ca. 3½ times that of controls on the day after treating with 3% Tormona.

4475. Malac, B. F. **Early indications of growth response following foliar applications of herbicides.** *Woodl. Res. Note Union Bag Pap. Corp., Savannah* No. 9, 1961. pp. 3.

Preliminary results are given for an experiment in releasing a 5-year-old *Pinus elliottii* plantation from competing hardwoods by 2,4,5-T applied as foliage spray from (*a*) mist blower, (*b*) ground sprayer, (*c*) helicopter. The most complete and uniform control was obtained by (*a*) and (*c*).

4476. McKonkey, T. W. **Release, browse damage, and growth of young White Pines.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 108, 1960. pp. 2.

In the 7 years after release from hardwood competition in 1952, 4-year *Pinus strobus* seedlings at the Massabesic Experimental Forest, Maine, showed greater height and diameter growth and better recovery from browsing than checked controls. Release is desirable, for only one-third of surviving controls became released naturally during the period.

4477. Baskerville, G. L. **Response of young Fir and Spruce to release from shrub competition.** *Tech. Note Dep. For. Can.* No. 98, 1961. pp. 14. 7 refs.

In 1949 all softwood reproduction on a one-acre plot at Green River, New Brunswick, was released by removing the shrubs within 3 ft. of each stem. An untreated plot was observed as a control. The object was to determine the response to release, in terms of height growth, in relation to the initial size of softwoods and shrub competition. For each stem, annual height growth was recorded for the nine years following release. Both Spruce [*Picea glauca*] and Fir [*Abies balsamea*] responded. Height growth increased up to six times that of control stems of the same size. Although shrubs re-occupied the openings in four years, the softwoods continued to grow at the increased rates throughout the study period. *From author's summary.*

4478. Bickerstaff, A. **A variable quadrat regeneration survey method.** *For. Chron.* 37 (1), 1961 (39–54). 5 refs.

A simple method of regeneration survey using a variable quadrat size has been developed. The size of quadrat is directly proportional to the height of the stem sampled. Trees included in the sample are those whose heights subtend a vertical angle of >45° along a baseline. For a baseline of 4·356 feet, each qualifying tree represents 10,000 linear feet per acre, or 1,000 linear feet for a baseline of 43·56 feet. The number of stems per acre in any size class is the quotient of the linear feet in that class and the height. The volume per acre of trees of merchantable size can be computed if their diameters are recorded. The theory and application of the method are described and the use of linear feet per acre as a measure of stocking is discussed. *Author's summary.*

237. Amelioration of Forest Sites

See also Nos. 3995, 4001–2, 4010, 4016–7, 4173, 4223, 4405, 4460, 4559, 4563, 4565, 4774–6, 5064.

4479. Nedkvitne, K., and Trøen, I. Nokre forsøk med gjødsling og andre tiltak i Sitkagranplantingar på lyngmark på Vestlandet. **[Trials of fertilizing and other measures in Sitka Spruce plantations on heathland in Vestland.]** *Tidsskr. Skogbr.* 69 (1), 1961 (26–39). 13 refs. [Nor.nor.]

Presents preliminary (5 years') results of trials on six sites where, without treatment, growth checks occur. On poorly drained plots, careful ploughing improved height growth but slightly reduced survival. Powdered limestone, applied in the planting hole, improved height growth on unploughed sites. Phosphates gave good height response on all sites, the effect increasing with dosage up to 100 g./plant; KCl did not. Best height growth was obtained with balanced fertilizer, or with mixtures of N and P fertilizers with or without K. Mulching with heather increased height growth, but removing the heather round plants reduced growth and survival [cf. *F.A.* 16 No. 2769]. *From authors' summary.*

4480. Hopkins, E. R. **The fertilizer factor in *Pinus pinaster* Ait. plantations on sandy soils of the Swan Coastal Plain, Western Australia.** *Bull. For. Dep. W. Aust.* No. 68, 1960. pp. 26. 21 refs.

Outlines the present extent of knowledge on the use of commercial pyrites slag, Zn sulphate, and P, N and K fertilizers, in *P. pinaster* plantations on the Swan Coastal Plain. Subjects discussed are: mode of fertilizer application in relation to nutrient-fixing capacity, leaching, and root development; the timing of further applications; the rate of response; and the scope, economic and practical, for subsequent fertilizer programmes. The major lines of research, established or being projected, are summarized and include suggestions for further study of the effects of thinning and pruning treatments in building up the soil organic content and returning nutrients to the site through accelerated litter decomposition.

4481. Stopkan′, V. V. Vplyv organo-mineral′nyh dobryv na rist sosnovyh kul′tur. **[Effect of organic and mineral fertilizers on the growth of Scots Pine plantations.]** *Dopovidi Akademiji Nauk Ukrajins′koji RSR* 1958 (1), (111–3). 1 ref. [Ukr.russ.e.] N.L.L.

On plots in plantations established in 1949 on sod-podzolic sandy old-field sites in the Ukraine, (*a*) compost, (*b*) compost + marl, and (*c*) compost + marl + NH_4NO_3 were applied in 1955, at rates of 8 tons compost, 2 tons marl, and 0·2 tons NH_4NO_3 per ha. Survival and height growth, measured up to 1957, showed significant improvement, both for faster- and slower-growing plots, over controls. There was little difference between treatments, but (*c*) was the best.

4482. Goor, C. P. van. **Fertilizing Norway Spruce in heathland afforestation.** *Stikstof, The Hague* No. 2, 1958 (60–6). 4 refs. [E.] A.P.B.

Fertilizer experiments on 15-year-old stagnating Spruce at Smilde showed best results for a mixture of phosphate (rock phosphate, basic slag, or superphosphate) and N (preferably in the form of NH_4NO_3 limestone, at 40–80 kg./ha.). Results, given in tables and graphs, show chemical composition of needles and relative increase in height for different fertilizers.

4483. Walters, J., Soos, J., and Haddock, P. G. **The influence of fertilizers on the growth of Douglas-Fir seedlings on the University of British Columbia Research Forest, Haney, B.C.** *Res. Note Fac. For. Univ. B.C.* No. 31, 1961. pp. 6. 10 refs.

Application of commercial granular fertilizer (NPK in proportion 6/8/6) to established seedlings significantly increased growth at all dosages tested (7, 14, and 21 g./seedling). "Mora Treefeed Pellets" (containing 24% N and 6% superphosphate) placed in planting holes when planting root-pruned 2 + 0 seedlings had no effect on growth.

238. Timber Plantation Crops requiring Special Treatment

4484. Tóth, I. A nyárasok értéktermelésének erdönevelési vonatkozásai. **[The relation of silviculture to value production in Poplar stands.]** *Erdö* 10 (2), 1961 (41–5 + smries. in suppl.). [Hu.g.russ.]

Economic Poplar stands of the State forests in the Danube flood-plain cover 3522 ha. Working-plan reports give, for the average site class, a rotation of 40 years for the highest value increment. Stand improvement by thinning is economic so long as the volume of principal fellings is encroached upon by ≯20%. The author calculates for a given case, with the help of a multiplication factor, the volume of exploitable thinnings from 50–60% of the periodic increment. This factor is weighted for stocking density, which itself is determined for stands up to 10 years by stand height and growing space and for stands >10 years by the ratio d.b.h./spacing.

24. Tending of Stands and Trees

241. Cleanings

See Nos. 4418, 4474.

242. Thinnings

See also Nos. 4337, 4484, 4579–80, 4863, 4977.

4485. Wiksten, Å. Beskrivning och analys av några fasta gallringsförsök i mellersta Norrland. Tall (*Pinus silvestris*). **[Description and analysis of some thinning experiments in central Norrland. *P. sylvestris*.]** *Medd. SkogsforsknInst., Stockh.* 49 (6), 1960. pp. 56 + 8 tbls. 27 refs. [Sw.sw.e.*e*.]

Detailed analysis of two short series established in 1924 and 1903 respectively, in stands now ca. 100 years old, indicated that financial yields—assuming various price levels and rates of interest—increased with severity of thinning, and volume increment over long periods (though not always over short) was greatest with light low thinning. Crown thinning was less favourable for both volume and value increment.

4486. Smirnov, N. T. Vlijanie rubok uhoda na rost kul'tur sosny ploščadkami. **[Effect of cleanings and thinnings on the growth of Scots Pine plantations established by patch planting or sowing.]** *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (43–8). 12 refs. [Russ.]

Tabulates sample-plot data on increment (b.a., height, and volume) in 1951–53 and 1953–56, for plantations in the Penza region, cleaned or thinned (removing ⩽ 15%, 16–25%, or 26–35% of the volume) for the first time in 1951 when they were 13–27 years old. No definite conclusions can yet be drawn, but it is clear that b.a. and height increment are determined primarily by the degree to which stand density after thinning approaches some optimum value, and to a much lesser degree by the % of the original volume removed.

4487. **Crown thinning in Western Larch.** *Extr.* from *Rep. Intermt. For. Range Exp. Sta. 1960*, 1961 (6–7).

Experimental thinnings made in 1949 in an over-stocked, 50-year-old, even-aged stand of *Larix occidentalis* indicate that a good response is made to crown thinning by the "D + 4" rule of thumb. By this method, 150–200 dominants or co-dominants per acre are selected as crop trees, and all trees removed round each crop tree in a circle whose radius in ft. equals the diameter of the tree in inches +4. This took ca. 2·5 man-days/acre.

4488. Worthington, N. P., and Staebler, G. R. **Commercial thinning of Douglas-Fir in the Pacific Northwest.** *Tech. Bull. U.S. For. Serv.* No. 1230, 1961. pp. 124. 90 refs. Smry.

Covers choice of method and intensity of thinning, organization and execution of operations, and costs.

4489. Wile, B. C. **Thinning a 50-year-old Fir-Spruce stand in central New Brunswick.** *Pulp Paper Mag. Can.* 62 (2), 1961 (107–9). 2 refs.

A 50-year stand of Balsam Fir and Red Spruce was thinned in 1936 (22% of total volume removed) and in 1942 (32% removed). Measurements in 1957 showed that the thinnings had probably accelerated mortality, especially of the Fir, had released the established reproduction, and had increased the diameter growth rate. Provided that mortality is kept low, these stands (site index 55) are capable of producing 70–100 cu. ft. wood/acre/year on stems of merchantable size, for several decades before maturity. The decline of Fir after 1949 indicates that it should be harvested by the age of 65.

4490. Baldwin, H. I. **Diameter growth of selected crop trees in sapling hardwoods.** *Fox For. Note* No. 82, 1961. pp. 1.

Potential crop trees ca. 10 ft. apart in a 20-year mixed hardwood stand were released in 1948 by cutting competing trees within a 4-ft. radius. Similar trees (2–4 in. d.b.h.) on an adjacent plot were unthinned. Measurements in 1954 and 1960 disclosed no difference between thinned and unthinned trees; crop-tree release in this type of stand should be more drastic to be effective.

4491. Eiberle, K. Untersuchung über Aufbau und Zuwachs von Buchenbeständen als Beitrag zur Durchforstungslehre. **[A study of structure and increment in Beech stands as a contribution to the theory of thinning.]** *Beih. Z. Schweiz. Forstver.* No. 31, 1960. pp. 83. 238 refs. [G.g.f.it.e.]

A detailed analysis of the structure of Beech stands on homogeneous sites that had been uniformly treated. The 48 temporary sample plots in each of 5 age classes (from 45 to 110 years) were grouped into 5 volume classes, and the effect of volume, Leibundgut's tree classes [cf. *F.A.* 18 No. 415], stem size, and stem quality on value production was studied. It is thought that the relationships found by this approach allow an assessment of thinning regimes. The tree classification gave a suitable indication of individual yield capacity.

4492. Bîrlănescu, E., and Clonaru, A. Contribuţii la cunoaşterea influenţei răriturilor asupra arboretelor de salcim. Efectul unei extrageri forte. **[The influence of thinning on *Robinia pseudoacacia* stands. The effect of an intensive operation.]** *Rev. Pădurilor* 75 (12), 1960 (738–41). 5 refs. [Rum. russ.g.f.e.]

Ca. 50% of the trees were extracted from a 21-year stand, and 6 years later the mean increase in d.b.h. was 51·2 mm. vs. 22 mm. in controls. The importance of early crown thinning, especially in stands of seedling origin, is stressed.

4493. Pulinec, M. P., and Ščukin, A. F. Rubki uhoda v estestvennyh molodnjakah barhata amurskogo v Primorskom krae. **[Thinnings in young natural stands of *Phellodendron amurense* in the Maritime Territory [of the U.S.S.R.].]** *Lesn. Hoz.* 13 (11), 1960 (17–9). [Russ.]

A general discussion of thinning practice for *P. amurense*, with recommendations on intensity of thinning.

4494. Cruttwell, C. R. **Thinning by poisoning in [New Zealand] State forests.** *N.Z. J. For.* 8 (2), 1960 (238–47). 5 refs.

[Cf. *F.A.* 20 No. 4575.] Thinning by poisoning has progressed over some 12,000 acres of exotic State forest since the practice was started in 1952 with the object of overtaking general arrears of treatment more quickly than has been possible by conventional methods. The practice has proved to have peculiar advantages in economy, in speed, in maintaining good access and stability, and in preserving the forest environment intact. These advantages appear to outweigh such risks to the health of the forest and safety of forest workers as are known to be incurred by the use of poisons. *Author's summary.*

4495. Harrison-Smith, J. L. **The poison technique applied to thinning of Radiata Pine.** *Farm For., Wellington* 2 (3), 1960 (46–52).

Gives a detailed account of methods, costs and results of large-scale operations, using an As solution, to thin dense young *Pinus radiata*, the thinnings being used as pulpwood. The standing poisoned trees are attractive to ovipositing *Sirex noctilio* females and, provided they are removed before a life-cycle is completed, the system forms an excellent trap for *Sirex* and possibly for other insects. Barking of poisoned trees is affected adversely if at all. Effect on weight is very variable.

4496. Henry, N. B. **Some aspects of the use of 2,4,5-T in the thinning of young Blackbutt (*Euc. pilularis*) regeneration.** In *Res. Note Qd. For. Serv.* No. 7, 1958. pp. 26. 2 refs. Limited distribution.

A number of experiments in the use of 2,4,5-T to prevent coppicing after thinning of dense 11-year-old *Eucalyptus pilularis* are described. Two methods were used: (*a*) application of a dilute solution to cut stumps, and (*b*) injection of a more concentrated solution into axe cuts in the standing tree. In the case of (*a*), a low stump height is essential; costs of a large-scale application are set out. Method (*b*) is cheap and effective, and is most efficient in thinning stems of 3- to 10-in. d.b.h. General economic aspects of the use of 2,4,5-T are discussed, and reference is made to possible changes in the species composition of the stand following this type of treatment.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 4292, 4494–6, 4667 *et seq.*

4497. Kolaković, R. Zasjenjenost tla kao mjerilo njegove zaštite i pomoćni regulator intenziteta meliorativnih sječa u šumama na hercegovačkom kršu. **[Shading of the soil as a means of protecting it and as an aid in regulating the intensity of improvement fellings on the Herzegovinian Karst.]** *Nar. Šumar, Sarajevo* 14 (7/8), 1960 (333–42). [Croat.g.]

A certain amount of shade, depending on soil condition, wind direction, slope, and nature of stand, must be preserved during improvement fellings to prevent further deterioration of the karst soil from excessive drying, erosion, etc. A minimum of 10,000 sq. m./ha. is suggested. The calculation of amount of shade from tree-crown projections is discussed, with data from two sample plots in degraded Oak coppice consisting chiefly of *Quercus pubescens*.

4498. Wyatt-Smith, J. **Intermediate fellings in Red-Meranti forest.** *Malay. Forester* 24 (1), 1961 (85–8).

Enumeration of an area of regenerated forest in Malacca in which, in 1958, contrary to standard practice, a permit was given to a specially reliable contractor to fell marked trees of ≥6 ft. g.b.h., subject to directional felling instructions for each tree and special care in the formation of logging roads, suggests that with these safeguards it is possible that intermediate fellings with a high minimum girth might be considered.

4499. Arend, J. L., and Roe, E. I. **Releasing conifers in Lake States with chemicals.** *Agric. Handb. U.S. Dep. Agric.* No. 185, 1961. pp. 22. Price $0.15.

Describes the present status of various chemical methods for releasing Pine and other conifer stands from the competition of undesirable hardwoods and brush, including foliage and basal spraying, basal cut-bark, spraying from the air, use of blowers etc.

4500. **The control of weeds and woody plants in forests.** *Abstr. 1960 Mtg. Weed Soc. Amer.* 1960 (26–7). O.W.

Includes the following brief reports: Aerial applications of silvicides for hardwood control and Pine release in Texas (*R. A. Darrow*) [tests since 1954 have shown that effective hardwood control on better sites is given by 1·5–2 lb./acre 2,4,5-T and 2,4,5-TP esters applied by fixed-wing plane at 8–10 gal./acre, and by helicopter at 5 gal./acre; rates are suggested for associations of Pine/Post Oak/Blackjack Oak, of Pine/White and Red Oaks/Sweet Gum, and of Pine/Sandjack Oak]; Tests of selective cull hardwood control in East Texas Pinelands (*C. B. Gibbs* and *G. K. Stephenson*) [studies over 10 years have shown that mechanical girdling is cheaper than axe girdling, but both must be used in combination with chemical treatments; 2,4,5-T esters in oil are an effective supplement to girdling during the growing season, and can be used as a basal spray or for basal injections at any season; low-volatile esters are as effective as high-volatile ones when used as a basal spray; iso-octyl ester is as effective for injections at the same concentration as propylene glycol butyl ether ester; undiluted ester concentrates are not effective; 2,4-D amine shows promise for application in concentrated form]; Chemical control of mistletoes (*H. R. Offord*) [no great success has yet been achieved with aerial applications of phytocides, but improved formulations of a number of compounds are listed that merit further testing, as foliage sprays, stem injections or sprays, and soil applications].

4501. MILLER, S. R. **Summary of three years' experience in large-scale applications of 2,4,5-T for hardwood control in the Southeast**. *Proc. 13th Ann. Sth. Weed Conf.* 1960 (157–65). O.W.

Reports some preliminary results of work in aerial spraying carried out by the Union Bag Camp Paper Corporation, Franklin, over the years 1956–58. Site preparation using 2,4,5-T alone does not appear to be a practicable method, but release of Pine can be achieved by 2,4,5-T foliar sprays under certain definite conditions. Adequate marking of spray swaths is a major problem. Good growing conditions for some time before spraying seem to be desirable, but heavy rains immediately after spraying have an adverse effect. Susceptibility to 2,4,5-T of some of the species encountered can be classified as follows: (1) susceptible: *Rhus* spp., *Liquidambar styraciflua*, *Nyssa sylvatica* and *Sassafras* spp.; (2) intermediate: *Myrica* spp., *Cornus* spp., *Magnolia virginiana*, and all Oaks except *Quercus virginiana*; (3) resistant: *Q. virginiana*, *Ilex coriacea*, *Acer rubrum*, *Fraxinus americana*, *Ilex opaca*, *Pinus palustris*, *P. taeda* and *P. elliottii*. Experiments in ground spraying are also in progress.

4502. GOODRICH, T. K. **Some observations on aerial spraying for Pine release in East Tennessee**. *Proc. 13th Ann. Sth. Weed Conf.* 1960 (151–6). O.W.

Reviews methods and equipment used by the Hiwassee Land Company, Calhoun.

4503. BOX, B. H., and BURNS, P. Y. **Results of aerial spraying for Pine release in western Louisiana**. *Proc. 13th Ann. Sth. Weed Conf.* 1960 (141–50). 4 refs. O.W.

Reports the results of aerial spray tests in W. Louisiana, carried out in three separate areas, on (1) 24 Sept. 1955, (2) 20–21 April 1956, and (3) 23–24 May 1956 respectively. Plot (3) was resprayed on 5 June 1958. The May spraying was the most successful for the control of undesirable hardwoods; (1) and (2) proved unseasonable. Greatest success was obtained with 2,4,5-T in oil/water (2 lb. acid equivalent/acre). Its triethylamine salt was not as effective as the esters. *From authors' summary.*

4504. RAY, H. C. **Significance of site in aerial chemical Pine release in the forested coastal plain of Arkansas**. *Proc. 13th Ann. Sth. Weed Conf.* 1960 (121–33). O.W.

Presents the results of studies on treated and untreated areas to determine the relationship between site, % control of hardwoods, and increase in forage production. Six sites were investigated for results of aerial sprays, each site having a different climax vegetation. On sites with a lower site index, control after one treatment was more effective than on better sites. Increase in grass production varied with the site, and on some sites may be attributed to the type of Pine stand at the time of treatment. In general, the success of aerial chemical Pine release depends on the potential productivity of the site, and the kind and amount of brush.

4505. SILKER, T. H., and DARROW, R. A. **Evaluation of aerial herbicides as forest and range management tools in western coastal plain**. *Proc. 13th Ann. Sth. Weed Conf.* 1960 (134–40). 4 refs. O.W.

Prescribed burns, although the best and cheapest means of controlling competition with Pine regeneration, cannot be used where (1) the area does not carry enough fuel, (2) the regeneration is not advanced enough to resist the fire, and (3) the hardwoods are too big or are fire-resistant species. An attempt was made to differentiate types of (3) by soil characteristics, along with an evaluation of the response to aerial spraying of stands on (*a*) deep sands, (*b*) moderate to deep sands above sandy clay, and (*c*) shallow to moderate sands above heavy clay. From the economic point of view, priority treatment is indicated for type (*c*) by the high and relatively uniform kill of undesirable species [cf. *F.A.* 21 No. 3311].

4506. SMITH, J. L. **Mist blower for controlling undesirable hardwoods**. *Sth. Lumberm.* 201 (2513), 1960 (185–6).

In tests in Shortleaf Pine stands, with hardwood understoreys up to 60 ft. high, 50–70% kill was achieved within a year by spraying with 2,4,5-T (low-volatile ester) oil/water emulsion, at 66·6 lb. effective acid/100 gal. and 3 gal./acre, on 20–30 ft. swaths. Coverage was 6·6 acres/hour at an estimated cost of $6–10/acre. The "Potts" blower unit used was mounted on a tractor, weighed 230 lb. and consisted of a 7-h.p. petrol engine, fan, housing, pump, pressure gauge and 27-gal. tank. The blower used less chemical and reached higher than boom sprayers.

4507. STARR, J. W. **The use of the mist blower for control of understory hardwoods**. *Proc. 13th Ann. Sth. Weed Conf.* 1960 (167–72). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1437). O.W.

An interim report of results of June 1959 and Jan. 1960 treatments with the acid, amine, and esters of 2,4,5-T in oil, water, or oil/water mixtures or as an invert emulsion, on the following: *Pinus* spp., *Quercus borealis*, *Q. alba*, *Carya* spp., *Liquidambar styraciflua*, *Nyssa sylvatica*, *Acer* sp. and *Diospyros virginiana*. Preliminary observation indicated (*a*) that the amines were less effective than the esters or acids; (*b*) 4 lb./acre does not give enough ncrease in kill over that from 2 lb./acre to justify the higher rate; (*c*) no marked difference in Pine damage resulted from oil as carrier instead of water or oil/water mixture; and (*d*) a total volume of 5 gal./acre was no more effective than 3 gal./acre.

4508. CANTELOU, L. B. **Mist blower—tree injector combination for hardwood control.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (177–81). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1435). O.W.

Spraying of brush over Loblolly Pine seedlings with 2,4,5-T by mist blower, stem-killed about 90% of the brush with minimum regrowth and defoliated trees up to 35 ft. At 2 lb./acre, however, it killed the Pine seedlings and also natural Pine 10–20 ft. high. It has been decided to use the mist blower only for brush devoid of Pine seedlings and to use the tree injector on adequately stocked areas of natural Pine seedlings or saplings needing release or on planted Pine overtopped only by hardwoods.

4509. MEADE, F. M. **Brush control with a tree injector.** *Arkansas Farm Research, Fayetteville* 9 (3), 1960 (11). From *abstr.* in *Weed Abstr.* 9 (10), 1960 (1798). O.W.

The injector is illustrated and its use described. In a trial with 2,4,5-T (low-volatile ester) at 2·5, 5 and 10% in water and in diesel oil, the 10% in diesel oil gave the best result and showed the following % kills after 2 growing seasons:—*Quercus borealis* 89, *Q. marilandica* and *Q. alba* 100, *Q. stellata* 98, *Carya* sp. 100, *Nyssa sylvatica* 67, and *Cornus* sp. 92. October was the best and early May the worst season.

4510. KNIGHT, V. J. **Some one-year results of several basal-applied herbicides on selected hardwood species.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (194–9). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1444). O.W.

The butoxyethanol ester of 2,4,5-T in diesel oil, oil/water emulsion or the invert emulsion, the isooctyl ester in diesel, the propyleneglycol butyl ether ester in diesel (1), the pentyl ester in diesel, the emulsifiable acid in oil/water emulsion, the amine in diesel, the butoxyethanol esters of 2,4,5-T plus 2,4-D in diesel, 2,4,5-TP in diesel, and benzoic amine and emulsifiable acid in diesel were all applied as basal bark treatments to *Carya* spp., *Quercus montana*, *Q. falcata*, *Q. borealis maxima* and *Q. marilandica* of 0·25–2·5 in. d.b.h. in July–August. No one treatment was best on all species, but (1) was generally best, giving 84% kill with no coppicing. The smaller trees were killed most easily. Oil solutions were better than emulsions; 5% 2,4,5-T gave better results than 2%, but the author considers that 3% may be satisfactory.

4511. MILLER, S. R. **Cost comparison of 2,4,5-T in tree injectors and ammate in cups for undesirable hardwood control.** *Woodl. Res. Note Union Bag Pap. Corp., Savannah* No. 8, 1961. pp. 2.

Cost of application of 2,4,5-T by tree injection was only ca. 38% of that of Ammate in cups. Comparisons of effectiveness are still to be made, but preliminary findings indicate that satisfactory kills can be obtained by either method.

4512. WYATT-SMITH, J. **Arboricide trials using Ammate X, 2,3-D, 2,4,5-T, and sodium arsenite.** *Malay. Forester* 24 (1), 1961 (81–4). 3 refs.

The results of this trial offer no hope that either 2,3-D or Ammate X is a satisfactory alternative to the present standard solution of 20% Na arsenite in water applied to a frill girdle. They confirm earlier findings that 2% 2,4,5-T in dieseline gives as satisfactory a kill as 20% Na arsenite in water, but needs great care in girdling and application; this, together with the difficulty and expense of transporting large quantities of dieseline into the forest, renders this treatment impracticable.

4513. WYATT-SMITH, J. **Further arboricide trials in lowland Dipterocarp rain forests of Malaya.** *Malay. Forester* 23 (4), 1960 (314–31). 2 refs.

Field and small-scale trials have indicated that spraying either 2,4,5-T (butyl ester) or 2,4-D/2,4,5-T (2/1) in diesel oil on to unbroken bark of large buttressed trees (including latex-bearing species) is ineffective. Trials have also indicated that 2% 2,4,5-T butyl ester in diesel oil, applied to a frill girdle, hitherto regarded as an acceptable substitute for the standard 20% aqueous solution of Na arsenite similarly applied, is much less effective on the larger trees, though it is comparable in its effect on the smaller trees. The relative susceptibility of species to arboricides varied widely (some data tabulated).

4514. NICHOLSON, D. I. **Comparison of 2,4-D and 2,4,5-T.** *Malay. Forester* 23 (4), 1960 (343).

Summarizes results of trials to determine the effectiveness of poison girdling with (*a*) 2,4-D alone and (*b*) 2,4-D + 2,4,5-T. These indicate that (*b*) is slightly more effective than (*a*) but that neither is totally effective.

245. Tending of Trees, Pruning etc.

See also Nos. 4374, 4553, 5205.

4515. TRENK, F. B., and KATOVICH, A. **Effects of live limb pruning on stem form in an understocked Pine plantation.** *For. Res. Note Wis. Coll. Agric.* No. 65, 1960. pp. 2.

In winter 1955–56, one *Pinus resinosa* tree from each of 17 random pairs, planted in 1938–40 at spacings from 9 × 14 ft. to 12 × 12 ft., was pruned to a height of 7 ft. Diameter measurements at two points on the stem at time of pruning and in Sept. 1960 showed that pruning did not tend to control taper, and had possibly been delayed too long. After measurement in 1960, pruning was extended to 17–18 ft. on the test trees, which averaged 29 ft. in total height. Remeasurement in 1965 should show whether this is sufficient to develop merchantable boles.

4516. SMITH, J. H. G., and WALTERS, J. **Prune large, immature Douglas Fir now.** *Res. Note Fac. For. Univ. B.C.* No. 30, 1961. pp. 6. 11 refs.

Describes the natural pruning of Douglas Fir, the increase in value due to pruning, the proportion of clear wood required, the growth of clear wood, patching to improve veneer quality, costs of pruning, and financial returns to be expected. [Cf. *F.A.* 18 No. 435.]

25. Treatment of Defective, Derelict or Very Open Stands

See also Nos. 5305, 5309.

4517. Nikolovski, T. Savremene metode intenzivnih direktnih konversija degradiranih šuma i šikara u SAD i mogućnost njihove primene u našim uslovima. **[Current methods of direct intensive conversion of scrub and coppice in the U.S.A. and the possibility of their application in Jugoslavia.]** *Šumarstvo* 13 (9/10), 1960 (441–53). 24 refs. [Serb. serb.f.*f.*]

4518. Shrivastava, S. S. **Rehabilitation of ex-proprietary forests of Madhya Pradesh.** *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (226–32).

The rehabilitation measures carried out since 1956 at 4 different centres in the ex-proprietary forests of Sagar Forest Division are discussed. A classification for management purposes is suggested.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

See Nos. 3988, 4271–2, 4365.

262. Fuel and Fodder Forests

See also Nos. 4524, 4526.

4519. Misra, B. R. **Creation of fuel-cum-fodder reserves in the plains of Chhattisgarh [,Madhya Pradesh].** *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (160–8). 2 refs.

A brief account is given of the fuel-cum-fodder farm forest at Pacheda, with details of work carried out and costs. Experience so far gained indicates that it is possible to afforest the lateritic soils characteristic of the Chhattisgarh plains, which have hitherto been regarded as too degraded for forest growth. An open fuel forest consisting of species such as *Azadirachta indica*, *Cassia siamea*, and *Terminalia tomentosa*, with fodder grasses such as *Pennisetum pedicellatum*, is likely to be obtained.

263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

See also Nos. 4189, 4532.

4520. Khan, M. I.-ur-R. **Forestry in the Thal.** *Pakistan J. For.* 10 (3), 1960 (200–8). 2 refs.

The Thal irrigation project covers an area of ca. 1½ million acres, of which ca. 40,000 acres have been planted with fuelwood and small-timber species in the form of national parks, village forest plantations, and shelterbelts. Figures are given for areas planted in different forest divisions.

4521. Broadfoot, W. M. **Reaction of hardwood timber to shallow-water impoundments.** *Information Sheet, Mississippi Agricultural Experiment Station, State College, Miss.* No. 595, 1958. pp. 2.

In recent years, farmers and sportsmen have built many temporary shallow-water impoundments in southern hardwood forests. The main purpose has been to attract wildfowl, but a recent study shows that these forest lakes, if properly managed, can also benefit the timber. The impoundments increase the amount of water that goes into soil storage, and this extra moisture is especially beneficial to trees in dry summers. But it was also found that the impoundments should be drained promptly each spring; letting the water stand for the whole year reduced growth for most tree species and even killed some. The method recommended is to impound ca. 6–12 in. in Sept. or Oct. and drain it off in April.

264. Farm Forests

4522. **Proceedings of farm forestry symposium [,Dehra Dun] 1958.** Indian Council of Agricultural Research, New Delhi. 1960. pp. 290.

In addition to a summary of discussions and conclusions, includes the following papers, as well as a number of others noticed separately in this issue of *F.A.*, on different aspects of farm forests and forestry (f.f.): F.f. and proper land use [in Madras] (*S. M. A. Aslam*); F.f.—pathological considerations (*B. K. Bakshi*); F.f. as a weather regulator and controller of agronomic practices in agriculture (*C. Balasubramanian*); Importance of shelterbelts in arid-zone farming (*C. P. Bhimaya, D. K. Misra* and *R. B. Das*); F.f. and wild life (*S. G. Bhogle*); The grazing problems in Phuljhar ex-Zamindari of Raipur District, Madhya Pradesh (*R. Chakravarti*); F.f. and wild life (*G. Chandra*); F.f.: its practice and scope in the Punjab (*E. S. Das*); F.f. in Orissa (*G. K. Das*); F.f. and co-operation (*S. S. Das*); F.f. in Eastern India (*J. K. Ganguly*); Planning of f.f. (*M. A. W. Khan*); F.f. and wild life (*M. Kumar*); The role of f.f. in the control of the Rajasthan Desert (*G. S. Lamba*); The role of f.f. in our national development (*G. S. Mathauda*); F.f. movement in Madhya Pradesh; (*B. R. Misra*); F.f. and their management in Himachal Pradesh (*J. N. Mullick*); F.f. in watershed management with special reference to Chotanagpur [Bihar] (*J. N. Pandey*); F.f. for India (*S. Pathak*); F.f. with special reference to afforestation around cultivated plots (*B. N. Prasad*); F.f.'s contributions to agricultural economy (*P. C. Raheja*); F.f. (*V. S. Rao*); F.f. and Vana Mahotsava (*S. A. Shah*); F.f. (*G. Singh*); F.f. (*J. A. Singh*); F.f. and wild life (*N. Singh*); Prospects of f.f. on barren spots in agricultural lands (*J. S. P. Yadav*).

4523. Raheja, P. C. **Farm forestry and proper land use: trees for farm land.** *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (191–5).

Lists, under various categories, the more important tree species.

4524. Singh, H. **Farm forestry in India with special reference to choice of species.** *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (235–40).

Gives notes on species suitable for hedge planting, fodder, and fuelwood.

4525. Sundararaj, D. D. **Scope of farm forestry in the agricultural improvement of South India.**

Proceedings, Farm Forestry Symposium, New Delhi 1958, 1960 (255–60).

Lists, under various categories, the more important tree species.

4526. VENKATARAMANY, P. [I.] **Farm forestry —what it is and why it should be adopted in agricultural farms in Madras State. [II.] Choice of species for farm forestry operations in Madras State.** *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (261–73).

[I.] Describes a typical Madras village and discusses the probable fuel consumption and the area of fuel plantations needed to meet it. [II.] Lists, under various categories, the more important tree species.

4527. KHAN, M. A. W. **Planning of farm forestry**. *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (130–5).

Suggests criteria for classifying villages, and methods of calculating the desirable forested area for a village. Suggestions are also made for the planning of the planting programme, protective measures, and the management of farm forests.

4528. RASHID, M. A. **Farm forests and their contribution to the agricultural economy**. *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (210–22).

An attempt is made to indicate the scope of farm forestry in India, and the scheme drawn up by the Bombay State Government for the creation of farm and village woodlots and the improvement of village grazing lands is outlined.

4529. SINGH, K. **Farm forestry in Rajasthan**. *Proceedings, Farm Forestry Symposium, New Delhi 1958*, 1960 (246–51).

Only 12% of the state is under forest, and that too is unequally distributed and very poorly stocked. The need for a Forest Extension Service is stressed and a programme suggested.

4530. GROOME, J. G. ***Cupressus macrocarpa:* a species of no value to farm foresters?** *Farm For., Wellington* 2 (2), 1960 (33–5).

Sets out the disadvantages of this species, which has been planted a good deal on New Zealand farms, both as groves and in shelterbelts.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

4531. FOUCHARDIÈRE, G. DE LA. Bois de talus. **[Timber in the hedges of the Breton *bocage*.]** *Rev. for. franç.* 13 (5), 1961 (311–6 + 3 photos). [F.]

Describes the '*bocage*' country in which the fields are surrounded by banks surmounted by rows of trees. This enormous capital of timber is seldom exploited except by lopping for firewood, and the desirability of reducing it, and simultaneously carrying out some afforestation, is expressed.

4532. SZIGETHY, L. Rizsföldek fásítása. **[Tree planting in ricefields.]** *Erdö* 10 (2), 1961 (73–6 + smries. in suppl.). [Hu.g.russ.]

Diconirt and Dicamin sprays used as ricefield weedkillers damaged Willow but not Poplar or Ash. At a spacing of 3 m. there is room along the bunds of the chief inlet and outlet canals and the communication routes for planting 7 Poplar trees per cadastral unit, of which there should be in Hungary by 1964–65, 35,000 units, giving a total of 735 km. of tree-row. Intermediate yields in the 7th or 8th years would cover 40–45% of planting expenses, and the final yield at 30 years is estimated to be worth 60 million Forints.

4533. MOULOPOULOS, C., and TSOUMIS, G. Auxētikai akanonistiai europamerikanikōn hubridiōn leukēs kalliergoumenōn en Makedonia. **[Growth abnormalities in hybrid Poplars cultivated in Macedonia.]** *Epistēmonikē Epetēris, Geoponikē kai Dasologikē Scholē, Aristoteleion Panepistēmion Thessalonikēs, Thessalonikē* 5, 1959 (197–237). 39 refs. [Gk.gk.e.*e.*]

A study of 361 trees and 287 stumps of a hybrid Black Poplar, presumed to be cv. 'Marilandica' or possibly 'Regenerata', planted in rows or strips on 7 sites along river embankments. Over 90% of the stems were ellipsoidal, oval, "double T-beam", or cycloidal in cross-section, 85% had a lean, and most of the stumps showed black heartwood and tension wood. The position of the longer axes lay generally in the direction of, and the lean away from, the prevailing strong winds. On one site, flood pressure appeared to be a contributing factor. The veneer yield of such abnormal logs was considerably less than that of comparable sound, straight logs. Avoidance of strip planting and selection of wind-resistant varieties are advocated.

266. Shelterbelts, Windbreaks

See also Nos. 4520, 4522, 4530.

4534. CATRINA, I., and CARNIAȚCHI, A. Determinarea penetrabilității perdelelor de protecție cu ajutorul măsurătorilor xilometrice. **[The use of measurements of wood volume to determine the penetrability of shelterbelts.]** *Rev. Pădurilor* 75 (10), 1960 (625–8). [Rum.russ.g.f.e.]

The penetrability of a shelterbelt is related to the volume of twigs in different height zones. Analysis of this relationship for different zones in 4 types of shelterbelt leads the authors to conclude that the penetrability of any shelterbelt can be calculated from the formula $I = 1/(V_o r + 1)$ where I is the index of penetrability and $V_o r$ is the volume of twigs in the 0–3 m. zone.

4535. NIKITIN, P. D. O konstrukcii polezaščitnyh lesnyh polos dlja Zavolž'ja, Zapadnoj Sibiri i Severnogo Kazahstana. **[On the design of shelterbelts for the Trans-Volga, W. Siberia and N. Kazakhstan.]** *Vestn. sel'.-hoz. Nauki, Moskva* 5 (8), 1960 (115–21). 4 refs. [Russ.e.g.f.] O.W.

On the basis of his own experience and the literature [cf. *F.A.* 22 No. 1851], the author compares the effect of (*a*) impermeable, (*b*) open, (*c*) permeable, and (*d*) open-permeable shelterbelts on wind speed and snow retention. It is thought that (*d*) is the best type, though it does not give such good protection from dust storms as (*b*) and (*c*). The (*d*) belts are narrow (4–6 rows), of one or two storeys, have no shrub layer, and allow a wind penetration of >70–75% in the lower part of the belt, and of 25–30 to 70–75% in the upper part. The rows should be 2·5–3 m. apart to enable tractor cultivation, and the trees should be 1–1·5 m. apart in the rows.

4536. TREŠČEVSKIJ, I. V. Opredelenie ėkonomičeskoj ėffektivnosti polezaščitnyh lesnyh polos. **[Determining the economic effectiveness of shelterbelts.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (20–3). [Russ.]

Develops an expression for calculating the profitability of shelterbelts, illustrating it with an actual example from the Voronezh area, which clearly shows the economic advantages to be gained from them.

4537. ZAJCEV, V. T. O protivoėrozionnom značenii lesnyh polos v Moldavii. **[The importance of shelterbelts in Moldavia in controlling erosion.]** *Lesn. Hoz.* 12 (12), 1959 (71–2). [Russ.]

Tabulates data on soil loss, the amount of humus, and total N in the 0- to 25-cm. horizon, and soil moisture content to a depth of 1 m., on slopes above, in, and below shelterbelts of various widths, and also on unprotected slopes. Soil loss on protected slopes was ca. ¼ of that on unprotected. Total humus was 5–6 tons/ha. greater on protected slopes, total N 0·2–0·3 tons/ha. greater, and soil m.c. 15–20% greater.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 4504, 4522, 4662 *et seq.*

4538. GRAFFER, H. Utviklinga av plantedekket og beitet i snauhogd og forskjellig tynnet bjørkeskog i Gausdal Vestfjell. **[Development of plant cover and pasture in clear-felled or thinned Birch at Gausdal Vestfjell.]** *Forskning og Forsøk i Landbruket, Oslo* 11 (2), 1960 (149–65). [Nor.e.] C.G.B.

Presents tabulated analyses of vegetation for 1933–57, and a table showing number of trees, volume and increment for 1928–54. Medium to heavy thinning, or, on good soils, complete removal of the Birch, gives best results for grazing.

4539. CAWLEY, E. T. **A phytosociological study of the effect of grazing on southern Wisconsin woodlots.** *Abstr. of thesis*, in *Dissert. Abstr.* 21 (6), 1960 (1342–3). O.R.S.

Subjects studied include the effect of degree of grazing on tree density and dominance, sapling density, tree canopy, the litter layer and air permeability, and % organic content of the soil.

4540. **Range plant hand book for Quetta-Kalat region.** *W. Pakistan For. Dep. Rec.* No. 1, 1960. pp. 53 + 51 drawings.

Includes a few trees and shrubs.

4541. OELRICHS, P. B., and MCEWAN, T. **Isolation of the toxic principle in *Acacia georginae*.** *Nature, Lond.* 190 (4778), 1961 (808–9). 4 refs.

The pods, seeds, and leaves of this species, which is widely distributed in N.W. Queensland, have proved toxic to sheep and cattle [cf. *F.A.* 18 No. 2872]. The toxic principle has now been identified as the fluoracetate ion. The occurrence of fluoracetate has also been reported in *Dichapetalum cymosum* in S. Africa, where this plant is responsible for serious stock losses.

4542. AASTON, M. **Control of woody plants in pastures and rangeland.** *Proc. Jt. Mtg. Nth. Cent. & 10th West. Canad. Weed Control Conf.* 1959 (5–7). From *abstr.* in *Weed Abstr.* 9 (11), 1960 (1992). O.W.

A general account, without mention of species, of mechanical, burning and spraying methods used for brush clearance in the Parkland Area of the Western Canadian provinces. Costs are given.

4543. CORNS, W. M. **Range weed and brush control.** *Res. Rep. West. Sect. Nat. Weed Comm. Can.* 1959 (78). From *abstr.* in *Weed Abstr.* 9 (6), 1959 (1000). O.W.

A number of weed species in mixed dune vegetation (*Amelanchier alnifolia, Arctostaphylos uva-ursi, Corylus cornuta, Lathyrus venosus, Populus tremuloides, Prunus melanocarpa, P. pennsylvanica, Rosa* sp. and *Symphoricarpos occidentalis*) were sprayed at 3 lb./acre in 30 gal. of water in June with different growth-regulators (2,4-D, 2,4,5-T, 2,3,6-TCA, and 2,4,5-TP). The varying susceptibility of each species to each treatment is tabulated.

4544. EHRENREICH, J. H., and CROSBY, J. S. **Forage production on sprayed and burned areas in the Missouri Ozarks.** *Journal of Range Management, Portland* 13 (2), 1960 (68–70). 5 refs. From *abstr.* in *Weed Abstr.* 9 (7), 1960 (1197). O.W.

The effects of a typical spring burn plus 2,4,5-T (4 lb./100 gal. oil/water emulsion) in June were evaluated on an area where the main species were *Quercus marilandica, Q. stellata, Q. velutina, Carya* sp., *Sassafras albidum, Rhus* sp., *Vaccinium* sp., *Tephrosia virginiana*, and *Andropogon scoparius*. The small trees were sprayed to run-off and the larger trees girdled. Five years after treatment, total herbage yield on sprayed areas was ca. 5·5 times greater than that of controls and 4·5 times greater than that of burned areas. *A. scoparius* and other perennial grasses accounted for nearly all the increased yield on the sprayed areas, owing to decreased competition from the hardwoods. On burned and control areas *A. scoparius* contributed about 25% of the total yield compared with 65% on the sprayed area. *Sorghastrum nutans* and *Panicum virgatum* yielded ca. 100 lb./acre on sprayed areas and nothing on the burned or control areas. *T. virginiana* contributed only ca. 10% of the total herbage yield from sprayed areas, but made up 50% of the total yield on burned and control areas, although there was no significant difference in its yield on the 3 areas. Only ca. 12% of the total yield on sprayed areas consisted of unpalatable plants, whereas ca. 65% from burned and control areas was unpalatable.

4545. EHRENREICH, J. H., and BUTTERY, R. F. **Increasing forage on Ozark wooded range.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 177, 1960. pp. 10. 5 refs.

In experiments in mixed hardwood range in the

Missouri Ozarks, forage production was increased 40–60 times (from <30 to >1800 lb./acre/year) by poisoning all trees or by a combination of girdling overstorey trees and spring burning. Broadcast sowing with *Festuca arundinacea* greatly improved forage quality.

4546. FISHER, C. E., *et al.* **Control of Mesquite on grazing lands.** *Bulletin, Texas Agricultural Experiment Station, College Station* No. 935, 1959. pp. 24. 26 refs. From *abstr.* in *Weed Abstr.* 9 (9), 1960 (1634). O.W.

The following successful methods of control, based on experimental results during 1939–1956 are discussed: (1) *Open stands:* (*a*) hand or power grubbing so as to uproot plants well below the lowest coppice buds; (*b*) basal treatment of single stems with sufficient kerosene or diesel oil (1–4 pints) to wet the bark and soil thoroughly to the lowest coppice buds; (*c*) spraying the lower 8–12 in. of the basal stems and the root-crown area with 2,4,5-T (ester) 8 lb. acid equivalent (a.e.) in 100 gal. oil (1 gal. solution to 10–15 trees); (*d*) basal spraying with monuron 1 lb. in 10 gal. water (1 gal. suspension/10–15 trees); (*e*) foliage spraying with 2,4,5-T 1 lb./acre a.e. in 10–15 gal. water. Methods (*b*) and (*c*) gave temporary control for 3–5 years depending on soil type; (*e*) controlled seedlings and coppice growth. (2) *Moderate to dense stands:* (*a*) Chaining or cabling gave control for 3–5 years ($1.5–$5.0/acre); in combination with other methods this proved economical for clearing areas of moderate potential productivity; (*b*) use of heavy-duty brush cutters on mixed brush areas gave control for 5–10 years ($5.0–$10.0/acre); (*c*) root-ploughing plus sowing with grasses ($8.0–$25.0/acre) was profitable on fertile soil; (*d*) aerial applications of chemicals at intervals of 5–7 years or after mechanical treatments gave good control at low cost. The most effective herbicide was 2,4,5-T (low-volatile esters) at 0·33 lb./acre acid in 3 gal. 1/6 diesel fuel and water, at swath widths of 60–84 ft. on original growth, or at 0·5 lb./acre acid in 4 gal. 1/3 diesel fuel and water, at swath widths of 42 ft., on coppice growth. Best kills resulted from sprays of droplet size 100–400μ applied 50–80 days after the first leaves appeared in spring. Experiments on seed survival and re-infestation of land showed that no one treatment completely eliminates Mesquite but that maintenance of a good grass cover plus treatments at 5- to 10-year intervals are required. Precautions for the use of 2,4,5-T are given.

4547. SHIGA, Y., and AOMINE, S. **The effect of shade trees on the grasses and soils of Mount Aso.** *Journal of the Science of Soil & Manure, Tokyo* 31 1960 (21–4). [Jap.] From *abstr.* in *Soils & Fertil.* 24 (3), 1961 (No. 1158).

Yields of grasses were higher under *Albizzia julibrissin, Alnus hirsuta* or *Quercus acutissima* than in the open, and the aerial parts had higher NPK and water contents. Leguminous trees contributed markedly to the fertility of the surface soil. Good hay yields under the trees were attributable to leaf fall, presence of roots, and N fixation.

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

4548. **Trees in town and city.** H.M. Stationery Office, London. 1958. pp. 83. 45 refs. P.R.

A copiously illustrated booklet discussing the amenity value of trees in urban areas, with details of their selection, planting and care. Lists of useful species and their characteristics are included.

4549. JAROSLAVCEV, G. D. Upakovka koma pri peresadke bol′ših derev′ev. **[Packing the root-ball in transplanting big trees.]** *Lesn. Hoz.* 13 (11), 1960 (34–6). [Russ.]

Describes and illustrates the design of a collapsible crate for holding the root-ball of big trees taken from the forest for transplanting as street or park trees.

4550. ULANOV, R. F. Peresadka vzroslyh derev′ev bez koma. **[Transplanting adult trees without the root-ball.]** *Lesn. Hoz.* 13 (11), 1960 (36–8). [Russ.]

In the Minsk region, *Tilia cordata* and *T. grandifolia*, 18–20 years old, are used for street and park planting. They are dug out as wildings without soil, leaving horizontal roots $\nless 1$ m. and vertical roots $\nless 40$ cm. long; the roots are puddled and covered in transit and the trees put into holes 2·5 × 2·5 × 0·8 m. with a layer of clay in the bottom. The holes are then carefully filled up with soil and well watered. Moss is packed round the stem, which is guyed. The tree is watered 3–4 times a month, and fertilizers may also be applied. Transplanting in autumn gave better results than in spring, and careful crown pruning is also useful. Mortality due to transplanting has been only 3·5% of >600 trees so transplanted.

4551. OSCAR, R. L. J. Efecto de diferentes diámetros, épocas de plantación y tratamiento hormonal sobre el arraigamiento de tres especies de árboles usadas para postes vivos. **[Effect of different diameters, planting dates, and growth-regulator treatments on the rooting of three tree species used as living posts.]** *Comun. cient. agríc. Inst. Interamer. Cienc. Agríc., Turrialba* (*Dasonomía*) No. 13, 1960. pp. 2. [Span.]

Outlines a trial to be made in 1960–61 on the rooting of large cuttings of *Erythrina costaricensis*, *E. poeppigiana* and *Gliricidia sepium*, species commonly used for live fence posts, shade trees in cocoa and coffee plantations, etc. in Costa Rica. Cuttings 2·5 m. long will be planted 0·5 m. deep. The variables studied will be: planting date (Aug., or Nov.), diameter of cutting (3–6, or 6–12 cm.), and growth regulator (a commercial mixture of β-IBA + α-NAA, or untreated).

28. Husbandry of Forest Products Other than Wood

See also No. 4331.

281. Christmas Trees

See also No. 4398.

4552. BALDWIN, H. I., and ROCK, D. A. **Douglas Fir as a New Hampshire Christmas tree.** *Fox For. Note* No. 80, 1961. pp. 2.

[Cf. *F.A.* 18 No. 2724.] After 9 growing seasons, trees from New Mexico seed were taller than Idaho and Montana sources, producing marketable trees at 6 vs. 9 years, and had fewer trees with yellow foliage (0·5 vs. 17 and 14%). A low-elevation source in Washington appeared unsuitable for New Hampshire. Survival and mean tree height were greater with trees planted in ploughed furrows than in undisturbed sod.

4553. Brown, J. H. **Slope or flat pruning of Pines—an important consideration in Christmas tree plantation management.** *J. For.* 59 (3), 1961 (213–4).

In trials with *Pinus sylvestris* and *P. resinosa* in West Virginia, trees were pruned by two methods, (*a*) "slope-pruning" (decapitating with a cut at an angle of ⩾45° to the main axis of the tree) and (*b*) "flat-pruning" (cutting at 90° to the axis). Both methods gave highly significant increases over unpruned controls in both number of terminals forming, and % of trees having multiple leaders. However, the mean number of terminals per tree, and the % of trees with multiple leaders, was much lower with (*a*) than with (*b*); (*a*) would thus give fewer crooked stems and Christmas trees of higher quality and value.

283. Fruit and Seed Crops etc.

See also No. 4216.

4554. Evreinoff, V.-A. Étude pomologique sur le caroubier *Ceratonia siliqua* L. **[A study of the fruit of *C. siliqua*.]** *Trav. Lab. For. Toulouse* 1 (6) Art. 6, 1960. pp. 16. 16 refs. [F.]

A description of the yield, chemical composition and harvesting of the fruit, plantation technique, varieties, and pests.

4555. Rivals, P. Les espèces fruitières introduites à l'Île de la Réunion: (notes historiques et biologiques). **[Fruit trees introduced in the Île de la Réunion: historical and biological notes.]** *Trav. Lab. For. Toulouse* 5 (1) Art. 3, 1960. pp. 96. [F.]

Notes on ca. one hundred species.

284. Crops Tapped for Exudations etc.

See also Nos. 4289, 4869, 4943.

4556. Adamovič, Ė. I. Smolonosnaja sistema eli sibirskoj (*Picea obovata* Ldb.). **[The resiniferous system of *P. obovata*.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (24–36). 7 refs. [Russ.]

A full description, with drawings, of the resin canals of the needles, bark, cones, normal stem- and rootwood, and stemwood in the neighbourhood of wounds and tapping faces.

4557. Mathauda, G. S. **Influence of climatic conditions on resin yield from Chir Pine (*Pinus roxburghii* Sargent) [*P. longifolia*].** *Indian For.* 87 (1), 1961 (20–5). 2 refs.

Data were collected in 4 localities covering the altitudinal range 2300–4500 ft. No correlation was found between resin yield and humidity, rainfall, or seasonal change in growth rate, but there was a significant correlation with temperature. Optimum yields are obtained with a mean daily temperature of ca. 80° F., and yields fall sharply as this drops to 75°. The value of 78° seems to be critical.

4558. Kinastowski, S., and Szczepański, K. Z badán nad wpływem żywicowania na fizyczne i mechaniczne własności drewna sosny pospolitej. **[Investigations on the effect of tapping on the physical and mechanical properties of Scots Pine wood.]** *Prace Inst. Tech. Drewna* 7 (1), 1960 (3–144). 20 refs. [Pol.russ.e.] P.R.

Samples of wood were taken from the bottom 2 m. and from ca. ⅓ height of (*a*) untapped trees, and (*b*) trees tapped for 2, 3 and 4 seasons before felling. The trees were of three diameter classes, from a stand of site class III and mean age 121 years. Comprehensive tests of the physical and mechanical properties of the wood were made, and the results (statistically treated) are tabulated and graphed *in extenso*. Most of the salient points are given in the 4-page English summary. It is concluded that wood from (*b*) can be regarded as equal or superior to that from (*a*), except for tensile strength ⊥, hardness, and cleavage resistance.

4559. Pustarnakova, N. S. Vlijanie mineral'nyh udobrenij na produktivnost' ėvkommii. **[Effect of mineral fertilizers on the yield of *Eucommia* [*ulmoides*].]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (99–115). 21 refs. [Russ.russ.]

Trials in Abkhazia showed that *E. ulmoides* responded well to complete mineral fertilizing (60–70, 50–60, and 35–45 kg. N, P, and K per ha.). [Cf. *F.A.* 18 No. 4795; 20 No. 3212.]

286. Osier-Growing

See also No. 4773.

4560. Krüger, H. Queckenbekämpfung mit Na-TCA (3 Ef) in mehrjährigen Korbweiden. **[Control of couch grass with Na-TCA (3 Ef) in Osier plantations several years old.]** *NachrBl. Dtsch. PflSchDienst, Berlin* 15 (1), 1961 (7–11). 1 ref. [G.g.russ.e.]

Trials were made in consecutive years with 3 Ef (TCA-Na) in Osier plantations infested with couch grass. Against germinating and newly emerged grass, 20–30 kg./ha. proved effective. Early spring treatments did not damage Willows several years old but later treatments and higher rates did. Although a reduction in Osier growth rate was noted when uninfested stands were treated, any such reduction in infested stands is considered to be outweighed by the elimination of grass competition.

287. Bamboo and Cane Growing etc.

4561. Perdue, R. E., and Creech, J. L. **Quadrangular Bamboo.** *Econ. Bot.* 15 (1), 1961 (87–90).

The Japanese constrict the emerging shoots of *Phyllostachys pubescens* in boxes 6–10 ft. long and 3 × 3 to 4·5 × 4·5 in. (internal cross-section), the box consisting of two L-sections tied about the culm and supported upright. Triangular, oval, and grooved variants are also made. In Kyoto, 7000 quadrangular culms were made in 1958. The price is 400–500 Yen ($1.11–1.39) per culm against 100 Yen for the unconstricted. They are used as decorative interior exposed members in houses, and for the manufacture of containers etc.

4562. BADHWAR, R. L., *et al.* **Collection and processing of canes.** *Indian For.* 87 (4), 1961 (257–61 + 2 photos). 2 refs.

A short account of suitable methods for canes [*Calamus* spp., *Plectocomia himalayana* and *Daemonorops jenkinsianus*] designed for different uses.

288. Crops Grown for Animal Products

4563. WELLENSTEIN, G. Ergebnisse vierjähriger Untersuchungen über die Steigerung der Waldbienentracht. **[Four years' results of trials to increase the honey harvest from the forest.]** *Z. angew. Ent.* 47 (1), 1960 (32–41). 20 refs. [G.g.] O.H.

An interim report on investigations into the effect of (1) tree fertilizing and (2) ant activity on honeydew production, chiefly by lachnids and coccids. (1) When 5-year-old potted Spruce, artificially infected with *Cinaropsis pruinosa* were fertilized with N, Ca, K, P, or trace elements, aphid populations on N- and Ca-fed plants increased rapidly, then quickly declined, whereas on K- and P-fed plants the increase was slower, but greater and more lasting. Field trials with $NH_4NO_3 \cdot CaCO_3$ in a Pine pole stand also increased populations of *Cinara pini*, *Protolachnus* and *Schizolachnus* spp. and other insects. (2) Lachnid populations were much greater at 10 m. from a nest of *Formica polyctena* than at 25 m. or further, and it was estimated that they produced honeydew considerably in excess of the ants' requirements. In a series of tests covering 40 villages in S.W. Germany and two summers, yields of beehives (*a*) in fields, (*b*) in forest with few ants, and (*c*) in forests with many ants, were in the ratio 1/1·6/2·4.

4564. THANGAM, E. S. **Rain tree [*Samanea saman*] as *kusumi* lac host—an interim report.** *Indian For.* 87 (4), 1961 (266–9). 5 refs.

This quick-growing species, introduced to India from S. America, has proved a suitable lac host in recent experiments. In view of its many uses (for shade, timber, fuelwood, leaf manure and cattle fodder, as well as possible lac cultivation) it is suggested that it should be widely planted as a roadside and village plantation tree.

289.4. Shade Trees for Crops

4565. WIGHT, W. **The shade-tree tradition in tea gardens of northern India. I. The value of shade. II. The use of ammonium sulphate. III. Superphosphate and light intensity.** *Annual Report, Scientific Department, Indian Tea Association, Tocklai* 1958 (75–98, 99–122, 123–50). 46 refs. From *abstr.* in *Hort. Abstr.* 30 (3), 1960 (No. 4561).

(I) Earlier experiments with Sau (*Albizzia chinensis*) shade trees and more recent work are evaluated. It has been shown that a reduction in illumination intensity greatly increases the yield of Assam tea. A greater uptake of N and other nutrients is obtained from organic compounds. The uptake of N by fungal symbionts and mycorrhizae may also be influenced by light intensity. Tea prunings were found to be a necessary addition to the soil but the use of Sau trees for shade had an additional nutritional value not obtained from the prunings. (II) $(NH_4)_2SO_4$ at 1000 lb./acre/year increased yields by 10–20%. Combining $(NH_4)_2SO_4$ with Sau shade has given even greater yield increases, the effect of the two treatments together being equal to the sum of the effects of either treatment alone. With screens for shade, however, the crop increases were less than those given by Sau trees, and the combined effect of screens and $(NH_4)_2SO_4$ was less than the sum of the separate effects. (III) The results of non-replicated experiments (described) lead the author to conclude that P and possibly Ca are necessary for the efficient utilization of N under shade, since superphosphate proved to be as effective a fertilizer as $(NH_4)_2SO_4$ under both Sau trees and screen shade.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

4566. **Study Group on Multilingual Glossary of Forest Work Science (Second Session). One hundred and twenty [logging] terms selected in 1957 from LOG/12 and classified under 1 and 2.** [*Docum.*] *FAO/ECE Jt. Comm. Working Tech.* No. *LOG/WP.*/5/2, 1960. pp. 125. [E.F.G.Sw.Russ.]

Includes: (1) guide list with the 120 terms in the 5 languages, English, French, German, Swedish, and Russian; (2) 120 loose-leaf pages, one for each term, giving its definition in 5 languages, and with additional new proposals for alternative terms or definitions.

4567. **Study Group on Multilingual Glossary of Forest Work Science (Second Session). Fifty-two terms belonging to ODC Primary Subhead 32, taken from LOG/12 (Nos. 244–295).** [*Docum.*] *FAO/ECE Jt. Comm. Working Tech.* No. *LOG/WP.*5/4, 1961. pp. 55. [E.F.G.Sw.Russ.]

Includes: (1) guide list with the 52 terms in the 5 languages, English, French, German, Swedish, and Russian; (2) 52 loose-leaf pages, one for each term, giving its definition in 5 languages, and with additional new proposals for alternative terms or definitions.

30. Work Science (Work Studies): General

302. Man and Work (Physiology and Psychology)

See also No. 4452.

4568. HANSSON, J.-E. Studier av inlärningsfrågor vid skogliga lärlingskurser. **[Some physiological effects of vocational training at apprentice courses in forestry.]** *Medd. SkogsforsknInst., Stockh.* 49 (10), 1960. pp. 84. 19 refs. [Sw.e.]

A study of 57 pupils, aged 14 to 18 at the start of a one-year's practical and theoretical course, covering the development of muscular strength and condition, skill in axe work, and mechanical efficiency (relation of performance to pulse-rate level) in barking and cross-cutting, during the course, with recommendations on improvements in training.

303. Training in Work Science and Efficiency

See Nos. 4568, 5314.

304. Hygiene. Safety. Accidents and their Prevention

See No. 4657.

305. Sequence of Work and Performance

See also Nos. 4326, 4452.

4569. NOVOTNÝ, M. Struktura pracovního času technických zaměstnanců polesí. **[Structure of the working time of technical forestry staff.]** *Lesn. Čas.* 7 (2), 1961 (116–29). [Cz.russ.g.]

A tabular analysis for three different grades of technical forestry staff, showing the %s of the working time taken up by the various jobs, using data from the experimental forest estates at Opočno and at Strnady.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 4361–2, 4411, 4441, 4451–2, 4470, 4509, 4656, 4660, 4668.

4570. Informations sur le matériel. **[Equipment news.]** *Bois For. Trop.* No. 76, 1961 (79–82). [F.]

Describes with illustrations and specifications the "Fraise à fosse Melio" (Gard, Potelières, St. Ambroix) [a small ditch-digger]; "Pelle-pioche pliante" (E. Guérin, 42 Rue de l'Échiquier, Paris 10) [a shovel-cum-mattock, the blade being adjustable to either position]; a simple device (no name or maker) to facilitate the hitching and unhitching of a logging arch.

31. Logging and Transport: General

See also Nos. 4320, 4578.

4571. JILES, R. A., JR., and LEHMAN, J. W. **Hardwood logging methods and costs in the Tennessee Valley.** *Rep. Tenn. Vall. Auth.* No. 232–60, 1960. pp. 40. 6 refs.

A detailed survey based on a study of 22 hardwood logging operations in 5 states.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

See also Nos. 5013, 5071, 5157, 5160.

4572. BALDWIN, H. I. **Winter harvesting of chemically debarked hardwood pulp.** *Fox For. Note* No. 81, 1961. pp. 2.

Tests were made in Jan. 1961 with a spud on trees treated with Na arsenite in various years. Air temperature was 0 to −5° C. Findings included the following: frost offered no obstacle to barking; thin-barked trees shed bark sooner than thick-barked trees of the same species, and thin-barked species sooner than thick-barked; after poisoning, 18–24 months should elapse before harvest; trees that shed bark early remain sound longer on the stump.

4573. KOEBELÉ, F. Ébranchage d'arbres avant abattage avec emploi d'une ceinture d'élagueur moderne. **[The lopping of trees before felling, with the use of a modern pruner's climbing harness.]** *Rev. for. franç.* 13 (3), 1961 (187–90). [F.]

Describes the use of the harness (of Swiss make) in combination with climbing irons, for lopping old trees before felling, in order to prevent damage to advance growth.

323. Felling and Subsequent Primary Conversion

See also Nos. 4572, 4575, 4577 *et seq.*, 4596–7, 5013, 5021–2, 5155, 5177.

4574. FEDJAEV, L. G. Osnovnye faktory, vlijajuščie na valku derev'ev. **[Basic factors affecting the felling of trees.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (78–84). 7 refs. [Russ.]

An analysis of the effect of (1) the weight of the aerial parts of the tree, (2) the natural "pull" (stem lean and crown asymmetry) of the tree, and (3) the wind. A table is constructed showing, for Scots Pine, Norway Spruce, Birch, and Aspen, of d.b.h. 12 cm. to 52 or 60 cm., the height, stem + crown weight, crown dimensions, and the magnitude of the overturning moment (in m.-kg.) in relation to stem lean and wind speed. Felling equipment creating an overturning moment of 5 m.-tons can ensure felling a tree in a set direction, irrespective of stem lean (up to 4°) and direction of wind (up to 5·2–7·4 m./sec.).

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also Nos. 4579–80, 4729–30, 5224, 5249–50, 5253.

4575. JOKERST, R. W. **Cutting short bolts means more wood—but more work too.** *Sta. Note Cent. St. For. Exp. Sta.* No. 144, 1960. pp. 2.

Measurements were made of the volume of wood recoverable in (*a*) 4-ft. and (*b*) 7½-ft. lengths (minimum diam. 4 in. o.b.) from the tops of 60 mixed hardwood trees cut for sawlogs to a minimum 8-in. u.b. top. With (*a*), 34% more wood was recovered than with (*b*), but the cutting surface in sq. ft. was increased by 159% and the number of bolts to be handled by 165%. The higher cost of production per cord for (*a*) may more than offset the value of the added volume produced.

4576. KELLY, W. B. **Australian scrub clearing methods.** *Unasylva* 14 (4), 1960 (179–84).

Describes (with illustrations) the equipment, methods of operation, and costs of several methods: (*a*) the 'scrub-roller', (*b*) 'chaining' [pulling a heavy chain between two tractors], (*c*) 'logging' [as (*b*) but with a heavy log dragged behind the chain], (*d*) the 'high ball' [as (*b*) but with a heavy steel ball attached to the chain], (*e*) the 'stumpjump' plough of heavy disk type.

34. Storage of Wood in the Forest and at Log Dumps ("Landings")

See Nos. 5021, 5071, 5155, 5177, 5179–80.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

4577. MAKKONEN, O. Aikatutkimuksia kuorimattomien 2·4-metristen koivupaperipuiden ja 2-metristen polttorankojen valmistuksesta samanaikaisesti. **[Time studies on the simultaneous preparation of unbarked 2·4-m. Birch pulpwood and 2-m. fuelwood.]** *Tied., Metsäteho, Helsinki* No. 180, 1960. pp. 6. [Fi.e.*e*.]

The studies were concerned with linking piece rates for 2·4-m. Birch pulpwood with those for coniferous pulpwood, and, in particular, with confirming that working time increases rather more with size for Birch and that large Birches, especially, are heavier than softwood species of the same size. Material studied comprised 167 stacked cu. m. Birch pulpwood, 57 stacked cu. m. Birch fuelwood and 72 stacked cu. m. Pine pulpwood, prepared by two experienced workers. Results showed that, with a minimum diam. of 8 cm., the rate per linear m. for Birch pulpwood should be almost the same as that for 2-m. Pine pulpwood. A threefold linear-metre rate should be paid for Birch with a top diam. of 7 in. and over. The rate for 2-m. Birch fuelwood should be 75% of that for Birch pulpwood. With a minimum diam. of 10 cm., the time for pulpwood preparation is somewhat lower, and that for fuelwood higher, than with a diam. of 8 cm., but the differences would have only a slight effect on earnings. Preparing stacks with logs piled all one way took 12–24% longer than preparing crosswise stacks, the difference increasing with increasing stem size. *From author's summary.*

4578. LUSSIER, L. J. **Work sampling method applied to logging—a powerful tool for performance analysis and operations control.** *Pulp Paper Mag. Can.* 62 (3), 1961 (130–2, 137–40). 7 refs.

The basis, methods, and reliability of work sampling (w.s.) are discussed, its pros and cons compared with those of continuous timing, and a trial of its use in a pulpwood-hauling operation is reported. Conclusions are that w.s. is a perfectly adequate method of performance analysis in logging. However, for short work elements (i.e. those occupying <5% of the total time) the use of w.s. is not recommended. For delay analysis, w.s. is a very good method, but it is preferable to extend the period of observation for as long as possible, since the frequency and nature of delays are a function of time; it is better suited to 'stationary' operations, e.g. loading, than to operations such as hauling, though results with the latter can be excellent. The potential uses of w.s. are outlined.

4579. CROWTHER, R. E. **The felling of thinnings.** *Sylva, Edinb.* No. 41, 1961 (10–11, 26).

A record of observations made by members of the Forestry Commission Work Study Section on fellers in various parts of the country. Trimming and barking, as well as actual felling, are described.

4580. SAMSET, I. Skogsdrift i yngre tynningsbestand. **[Thinning operations in young stands.]** *Medd. Norske Skogforsøksv.* 16 (6), No. 58, 1960 (361–597). [Nor.nor.e.*e*.]

Presents detailed results of method and time studies carried out at Tynset, 1954–55, and at the Treschow-Fritzøe forests, near Larvik, in 1956–57. The material comprised fuelwood and pulpwood from clear fellings of young and mature Birch (*Betula pubescens* and *B. tortuosa*) and thinnings in young, medium and nearly mature stands of Scots Pine and Norway Spruce. Subjects studied included: solid volume and number of bolts per bundle in relation to d.b.h.; volume of chips per cu. m. when wood was prepared for fuel, and chip volume in relation to stacked volume of wood before chipping; drying of wood in relation to barking, method of stacking and date of felling; stain and decay in relation to the density of the wood after 2 summers' storage as a % of green density; felling and cross-cutting performance in relation to tree size and taper; relative times for various felling operations (felling, trimming, barking, cross-cutting, stacking, making supports and hand skidding); total time at the work site in relation to d.b.h. and to working conditions, and its use in calculating costs; suggested piece-work rates for felling and preparing bundles; skidding time in relation to equipment and methods used; methods of reducing terminal and under-way time in skidding; skidding costs; and lorry transport, and loading and unloading of the bundles.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 4573, 4595, 4597, 4904.

4581. MIKULINSKIJ, V. I. O profilirovke zub′ev pil dlja poperečnoj raspilovki. **[Profiling saw teeth for cross-cutting.]** *Lesn. Ž., Arhangel′sk* 3 (4), 1960 (116–9). 1 ref. [Russ.]

Analyses optimum tooth shape theoretically, and then presents some experimental data comparing three tooth profiles. One, an asymmetrical tooth with sharpness angle 40°, clearance angle 20°, and angle ϵ (angle of the main edge to the side of the kerf in the plane normal to the vector of the speed of cutting) 76°08′, appears very promising, as the power requirement is considerably reduced without impairing sawing quality. Investigations on this type of profile continue.

4582. LAUTNER, Ė. M. Opredelenie usilij, voznikajuščih pri pilenii pil′nymi cepjami. **[Determining the forces occurring when sawing with chain saws.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (82–5). 4 refs. [Russ.]

Presents the theoretical results of an analytical investigation of the process of ripsawing wood with saw chains consisting of round-hooded (gouge-shape) teeth cutting alternately left and right. Seven equations are developed for the magnitude of all the forces acting during the process of cutting, with two final equations expressing respectively the total horizontal and the total vertical component of the forces.

4583. USPENSKIJ, V. A. Issledovanie shem stružkoobrazovanija pil'nymi cepjami otkrytogo profilja. **[Investigation on chip formation by open-profile saw chains.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (86–92). 4 refs. [Russ.]

A theoretical analysis of the process of chip formation with a conventional [cutter-raker] PC-15m saw chain [cf. *F.A.* 19 Nos. 1806–7] and another of simpler design, with diagrams showing chip formation, and deriving conclusions on the lowering of the other teeth below the level of the cutters.

4584. LUKAŠIN, M. M. Issledovanija processa pilenija merzloj i taloj drevesiny cepjami PC-15m. **[Investigation of the process of sawing frozen and thawed wood with PC-15m chain saws.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (50–6). 4 refs. [Russ.]

In investigations with an experimental rig incorporating a saw chain similar to that of the conventional PC-15m chain saw [see *F.A.* 19 Nos. 1806–7], Larch, Scots Pine, Norway Spruce and Birch were sawn at temperatures of +16, −10, −20, −25, and −30° C. Rates of sawing (sq. cm./sec.), resistance to sawing (kg.), specific resistance to sawing (kg./sq. mm.), and specific electricity consumption (watt-second/sq. cm.) were determined, and the results are tabulated. The effect of the thrust force (7–22 kg.) was also studied. At −10°, sawing rate was less than at positive temperatures, and specific resistance to sawing and the electricity consumption were greater. At −20°, sawing rate was close to that at +16°, and at −25° and −30° the sawing rate was greater than at +16°. With increasing thrust force, the sawing rate and resistance to sawing increased, while the specific resistance to sawing decreased. The chemical and physical reasons for these changes in the sawing properties of wood with decreasing temperature are discussed.

4585. PLATZER, H. B., and SACKEL, W. Erfahrungen mit neuen Schleif- und Schärfapparaten. **[Trials with new grinding and sharpening devices.]** *Forst- u. Holzw.* 16 (6), 1961 (136–8, 140–2). 5 refs. [G.g.]

Describes the "Transparent" axe-sharpener (Stephan-Werke, Hameln, W. Germany) which employs perforated grinding disks, and the Nielsen-100-B sharpener for round-hooded chain-saw teeth (Nielsen Saw & Supply Co., Rosenburg, Ore.), and gives details of their use.

4586. FREYSOLDT, E. Elektrische Sichtschleifmaschine. **[An electrical "visible-grinding" machine.]** *Allg. Forstzeitschr.* 16 (7), 1961 (126). [G.]

The machine, designed for hand tools, consists essentially of an electrically driven, horizontally rotating, metal disk coated with an abrasive and fitted with radial slits. At 2900 rev./min. one can see through this disk stroboscopically, so that the tools held on the underside of the disk can be kept under observation during the actual sharpening process. The machine, with motor, special light and a safety device, costs DM.231; additional "Strobolux" disks, obtainable in various grit numbers, DM.17.

4587. BUTORA, A., and JANČO, J. Analýzy pracovného procesu pri spil'ovaní stromov motorovými pilami. **[Analysis of work in felling trees with power saws.]** *Lesn. Čas.* 7 (2), 1961 (81–97). [Slovak. russ.g.]

Compares the performance of three 1-man power saws, a 2-man power saw, and a 2-man hand saw, in felling Spruce. Results, given in tables and graphs, indicate that output per man is greatest with the 1-man power saws.

4588. PAVELESCU, I. M. Cîteva rezultate prilejuite de folosirea experimentală a ferăstraielor mecanice la tăierea arborilor din crînguri. **[Results obtained in experimental felling of *Quercus cerris* coppice with chain saws.]** *Rev. Pădurilor* 75 (10), 1960 (616–9). 2 refs. [Rum.russ.g.f.e.]

Experiments showed that the chain-saw makes a clean cut, and a lower stump than the axe, and makes possible an output per man-hour 6–7 times that of the axe.

4589. Maschineneinsatz im Forstbetrieb. Technische Grundlagen—wirtschaftliche Voraussetzungen. **[Mechanization in forestry. Technical and economic aspects.]** *Forsttech. Inform., Mainz* 1960 (8; 9), (55–72). 8 refs. [G.]

[Cf. *F.A.* 21 No. 4434.] No. 8 discusses ploughs (*Fricke*), and harrows and cultivators (*Fischer*); No. 9, splitting, chopping and chipping equipment (*B. Strehlke*) on an international basis.

4590. **Mechanical pulpwood splitter.** *Aust. Timb. J.* 26 (12), 1961 (81–3).

Built by Log Splitting Machines Co. of Bilpin, N.S.W. It is claimed that with one gallon of dieselene, 7 tons of green wood can be split at 10*s.*/ton (including operation, fuel, depreciation etc.). The single blade of this portable splitter splits, on both forward and back strokes, logs up to 8 × 3½ ft. diam. Other possible applications are for fence posts, mine props, charcoal wood and fuel.

4591. CERCHEZ, G., and COPĂCEANU, D. Despicarea mecanică a lemnului. **[Mechanical cleaving of wood.]** *Rev. Pădurilor* 75 (8), 1960 (487–90). [Rum.russ.g.f.e.]

Presents the main technical features of the Soviet KT-5 and KUK-1000 cleaving machines and their performance under Rumanian conditions. They are unsuitable for cleaving hardwoods with various defects of form and structure and diameters of ⩾1 m., and for this purpose a Rumanian machine DL-8 has been designed, built and tested (plans given).

4592. HUSZÁR, E. A vágáslap alatti fatömeg kitermelésének néhány kérdése homoki tölgyeseinkben. **[Problems in the utilization of stumpwood from Oak stands on sandy sites.]** *Erdö* 10 (1), 1961 (23–31 + smries. in suppl.). 13 refs. [Hu.g.russ.]

From Soviet literature and the results of the present study, recommends, as the best solution for average firm soil, the use of the stumping adapter K-1A on an S-10 tractor, or, if such are not available, tractors with dozer blades. For these, preparatory manual work (cutting of long side-roots down to 25–30 cm. depth) is needed.

4593. SKAL'SKIJ, M. U. Ispol'zovanie vibroudarnogo metoda dlja proizvodstva korčeval'nyh rabot. **[Using a vibratory shock method in stump-grubbing.]** *Lesn. Hoz.* 13 (12), 1960 (40–3). [Russ.]

Illustrated description of a vibrating grab which imparts vibratory movement (vertical) to the stump, thus facilitating its uprooting.

4594. TITOV, N. I. Razrabotat' novyj sposob korčevki pnej i podgotovki počvy na lesosekah. **[Working out a new method of grubbing up stumps and preparing the soil on felled areas.]** *Lesn. Hoz.* 13 (11), 1960 (68–70). [Russ.]

Suggests the use of special saw chains for severing the roots of stumps in felling areas. Four possible designs of chain are illustrated, using the following method: three steel guide-bars are hammered into the ground round a stump ca. 1 m. from it, to a depth of 50–60 cm. and at an angle of 45° to the tap root. The saw chain (some 7–8 m. long) is passed round the three bars and, pulley-driven from a tractor, slips down the guide-bars into the soil, cutting through any roots it encounters. When it reaches the lower end of the bars, the chain cuts along horizontally, severing the taproot or vertical roots, and is finally pulled out of the ground. The stump can then be lifted out easily by a tractor with a crane. Another possibility suggested is the fitting of a pulley-driven saw chain on a tine plough (without a mouldboard), to sever roots during the tillage of cut-over areas.

372/377. Land Transport

See also Nos. 4318, 4570, 4578, 4580, 4871–2, 4959.

4595. KITCHENER, D. T. **Mechanized logging.** *APPITA, Melbourne* 14 (4), 1961 (159–62).

A review of developments in felling, hauling from stump to roadside, loading, and transport, by the Australian Newsprint Mills Ltd., and of their effects on labour, silviculture, finance, etc.

4596. MEADOWS, W. G. H. **Logging in the higher rainfall areas of Tasmania with special reference to the use of mobile equipment.** *APPITA, Melbourne* 14 (4), 1961 (163–7). 1 ref.

A review of logging operations in high-rainfall (generally >60 in.) areas with low evaporation, and resultant muddy conditions, in Eucalypt/*Nothofagus* stands having a high % of unmerchantable wood militating against economic high-lead logging. The use of a Skagit SJ-4-RT mobile yarder-loader is described, but most success has been obtained by retention of tractor yarding and using the SJ-4-RT for loading. Savings are not great, but incidental benefits result in greater over-all efficiency. In some very steep areas, no other known methods could be economically employed.

4597. ROSE, L. B. **Progress report on harvesting machines.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 2035 (*B*-1), [1961]. pp. 2.

A review of N. American developments in timber-harvesting machinery, describing seven machines ranging from prototypes to pre-production models, and of varying versatility, from felling and bunching only, to complete combines whose end-function is stacking.

4598. KORUNOV, M. M. Prohodimost' mašin i poezdov po merzlym bolotam. **[The ability of [logging] machines and trains of vehicles to pass over frozen bogs.]** *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (68–73). 8 refs. [Russ.russ.]

[Cf. *F.A.* 19 No. 4314; 21 No. 4495.] Presents several formulae for calculating the load-bearing strength of frozen bogs (peat continuous, or interrupted by pools etc.), for machines and trains < and >25 m. long.

4599. DOYLE, J. A. **Progress in logging—1960.** *For. Prod. J.* 11 (2), 1961 (49–53).

Discusses trends in the organization of operations and briefly describes equipment used, including the Wilko MKV skyline system installed in the Alberni Watershed region of British Columbia, consisting of a single skyline that operates solely from a 110-h.p. propane-powered motor housed in a 5-ton remote-controlled carriage, with a 15-ton payload. It covers a strip up to 500 ft. wide and can handle 25,000 bd. ft./day with a 3-man crew.

4600. MCINTOSH, J. A., and GUNN, D. C. **Pre-logging with a portable steel spar.** *B.C. Lumberm.* 44 (8), 1960 (10 . . . 16). 2 refs.

A time study similar to one previously described [see *F.A.* 20 No. 3231], carried out in mature and overmature Cedar/Hemlock/Balsam with an understorey of the same species. A 90-ft. portable steel spar powered by a 150-h.p. diesel unit and light rigging was used. A summary report on the over-all harvesting operation [pre-logging plus logging plus salvage logging?] will appear when the study is completed.

4601. MARKO, V. Ekonomická štúdia o zbližovaní rovnaného dreva prenosnými šmykmi v ťažkoprístupných porastoch. **[An economic study of the extraction of roundwood by transportable chutes in relatively inaccessible stands.]** *Lesn. Čas.* 7 (2), 1961 (106–15). [Slovak.russ.g.]

4602. LEVANTO, S. Puutavaran hevosjuonnon nykyvaihe: juontovälinetiedustelun tuloksia. **[The present position of skidding by horse [in Finland]: results of an enquiry on skidding equipment.]** *Julkaisu, Työtehoseura, Helsinki* No. 90, 1961. pp. 74. 31 refs. [Fi.e.]

Part 1 presents results of a country-wide questionnaire, suggesting that the supply of horses is inadequate, especially in the S., W., and central parts of Finland. Tractors are used to some extent but are too expensive for small amounts of wood from private forests. In some parts, felling directly alongside the spur roads has reduced the need for skidding but 91% of the replies indicate that some form of horse skidding is used, comparatively little skidding being done during summer. Ordinary hauling sledges are generally used, both on frozen and unfrozen ground. The different types of sledge in use are discussed; the type preferred varies with locality and terrain. Part 2 describes and illustrates equipment used.

4603. FEDOROV, A. A. Soveršenstvovanie podvozki lesa guseničnymi mašinami. **[Improving the transport of timber by crawler machines.]** *Lesn.*

Ž., Arhangel'sk 3 (3), 1960 (63–9). 6 refs. [Russ.]

Using an experimental crawler tractor, compares the moving of tree-length logs and whole trees (*a*) entirely on the ground, i.e. skidded by cable behind the tractor, (*b*) semi-mounted i.e. with butts or tops on the tractor, or (*c*) entirely carried on the tractor. Under identical conditions, taking case (*c*) as 100%, the mean resistance to movement in (*a*) and (*b*) was 270 and 181% respectively. Fuel and power costs per unit weight (or volume) of load, track slip, and damage to regeneration are all reduced with method (*c*).

4604. GOBERMAN, L. A. Opredelenie poter′ na buksovanie pri postroenii tjagovyh harakteristik proektiruemyh trelevočnyh traktorov. **[Determining slip losses when fixing the draught characteristics of planned skidding tractors.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (57–66). 1 ref. [Russ.]

A theoretical study, from which two nomograms are constructed for determining the slip coefficient.

4605. BABUŠKIN, I. N. O nekotoryh parametrah i metodike opredelenija moščnosti trelevočnogo traktora. **[Certain parameters, and a method of deciding on the power of a skidding tractor.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (67–72). 3 refs. [Russ.]

Using actual skidding performance data for 4 different Soviet models of crawler tractor, the author develops theoretically a method of selecting a skidding tractor of optimum power for a given set of felling conditions. The parameters on which this method is based include load per trip, tractor weight per unit of h.p., and engine loading coefficient. Optimum tractor h.p. is calculated for felling sites where the standing volume is <200 cu. m./ha. (mean stem volume 0·2–0·4 cu. m.), <250 cu. m./ha. (0·4–0·75 cu. m.), <300 cu. m./ha. (0·75–1·5 cu. m.), and ≥300 cu. m./ha. (1·5 cu. m.).

4606. STREHLKE, B. Ergebnisse eines langfristigen Schlepper-Versuchseinsatzes. **[Results of a long-term tractor trial.]** *Holz-Zbl.* 86 (143), 1960 (2019–22). 16 refs. [G.g.]

Discusses time and cost studies on a Ferguson FE 35 and various accessories in the hilly country near Hann.-Münden [cf. *F.A.* 19 No. 957] partly in comparison with a Unimog. Most of the time the tractor was used for skidding, which it could, in general, do at less than contract rates for stemwood, but not for cordwood (moved cheaply by farmers in the slack season). Many accessories could not be used often enough to be economic.

4607. Traktorseilwinde "Traun". **[The "Traun" tractor winch.]** *Allg. Forstztg.* 72 (5/6), 1961 (62). [G.]

The winch, whose drum can hold 200 m. of 11-mm. cable, can be fitted to the rear axle of most tractor types, next to the wheels, and is driven via the normal gears, alternatively with the wheels. With a Steyr 80a 15-h.p. tractor, tractive power was 2000 kg. for one and 4000 kg. for two winches (one on each side of the differential), with cable speeds of 0·35 m./sec. in first and 1·65 m./sec. in fourth gear. A log-lifting device, working like a logging arch, is supplied as an accessory.

4608. KOPELEVIČ, L. M. Metod sravnitel′noj ocenki lesotransportnyh kolesnyh mašin po prohodimosti. **[A method of comparative evaluation of the mobility of wheeled timber-transport machines.]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (79–84). 5 refs. [Russ.russ.]

A theoretical analysis of the resistance to movement of wheeled timber transport machines [i.e. lorries and trailers], and of ways of improving performance. The introduction of power-drive for the trailer, and the use of extra-low-pressure tyres, are regarded as the most promising measures.

4609. RAHIKAINEN, H. Kokemuksia palstatieltä tapahtuvasta tukkien autokuljetuksesta. **[Experience of lorry transport of sawlogs from spur roads.]** *Metsät. Aikak.* 1961 (2), (62, 64–6). [Fi.e.*e.*]

During the snowless period, or when snow was not deep (<40 cm.), lorries could move fairly easily on spur roads except on very uneven or stony ground. The siting of spur roads must be adapted to the terrain, to give, for full loads, upward gradients <12% and side slopes <5%; if side slopes are 5–10%, it should be for so short a distance that only one axle of the lorry takes this maximum slope at a time. Lorries with 4-wheel drive are the most suitable for this work. The saving in cost as compared with normal horse/lorry transport is considerable, ca. Finmark 10–12 per cu. ft. *From author's summary.*

378. Water Transport

See also Nos. 5021–2, 5121.

4610. RASSUDOV, B. A. Traktory na skatke lesa v vodu. **[Tractors for launching timber into the water.]** *Lesn. Prom.* 1961 (3), (10–1). [Russ.russ.]

A theoretical analysis for determination of the correct height of the pushing blade of tractors and bulldozers, and the optimum stack size, in order to achieve maximum launching output. Data are given for stacks on level ground and on slopes up to 30°.

4611. MODIN, S., HELLSTRAND, G., and ESSEEN, G. Skiljningsarbetets mekanisering—det aktuella läget. **[Mechanization of sorting—the present position.]** *Extr.* from *Årsb. Svenska Flottledsförb.* No. 34, 1960 (5954–64). [Sw.e.]

Illustrated accounts of the lay-out of equipment for sorting floated timber at Sandslån on Ångermanälven, Tägten on Dalälven, and on Kalixälven.

4612. ANGELIN, S.; HALLHAGEN, F. **[New equipment for floating timber past hydro-electric plants.]** *Extr.* from *Årsb. Svenska Flottledsförb.* No. 34, 1960 (5884–5953). [Sw.e.]

Two illustrated papers, with discussion, describing the use of slipways, flumes, etc. and of auxiliary equipment, e.g. current-makers, feed rollers.

4613. **Loading devices help Finns move logs.** *Timberman* 62 (1), 1961 (50–1).

Includes three methods of lifting logs over dams:

for bundled logs a rams-horn hoist system and a counter-balanced carts-on-cableway system, and, for unbundled logs, a grab on a gantry. [Cf. *F.A.* 22 No. 635.]

4614. Ryncyn, V. Pogruzka lesa s vody v suda. **[Loading wood from the water into boats.]** *Lesn. Prom.* 1961 (3), (14). [Russ.]

Describes two successful methods of loading bundles (ca. 3 cu. m. each) from bag rafts into lighters (*a*) with, and (*b*) without, their own loading cranes or derricks.

38. Forest Engineering

383. Roads and Bridges

See also Nos. 4959–60.

4615. Herpay, I. Erdei utak pályaszerkezetének kiválasztása. **[Choosing the carriageway structure for forest roads.]** *Erdö* 10 (1), 1961 (1–10 + smries. in suppl.). 8 refs. [Hu.g.russ.]

Presents a simple graphic method for determining the cost of a preferred construction in terms of the distance road material must be carried, and for the correct weighting of all the factors governing the choice of the type of construction, e.g. capital and maintenance costs, traffic, turn-round time etc.

4616. **[Special number: concrete forest roads.]** *Forst- u. Holzw.* 16 (8), 1961 (173–91). Several refs. [G.]

Contains several papers, including: Is concrete road construction feasible in the forest? (*Strehlke*) [analyses of costs, maintenance, construction and suitability indicates that it is]; The importance of the subgrade for concrete road construction in the forest (*K. Eberle*); Experience and developments in concrete road construction in the Herborn forest district (*Kappes*) [since 1950]; Wooden expansion joints (*E. Rissel*) [an illustrated report on the correct way to lay concrete roads with wooden expansion joints]; Concrete road construction in the mountains under difficult drainage conditions (*Solch*) [a review of experience since 1955 in a forest district in the Schwarzwald]; Concrete forest roads on trial —a study of their maintenance and repair (*Petri*); Protecting the edges of concrete roads with wooden sides (*E. Bender*); The concrete stretch of the Burgtal road in the Wachenheim (Weinstrasse) city forest—the oldest concrete forest road in W. Germany (*Gründel*) [an illustrated history of this stretch of road, built in 1937].

4617. Lajko, M., and Gavrilov, I. Železobetonnym pokrytijam—zelenuju ulicu. **[The green light for reinforced-concrete road surfaces.]** *Lesn. Prom.* 1961 (3), (17–8). [Russ.]

Reviews costs and performance, after >3 years' experience with these roads [see *F.A.* 19 Nos. 4317–8], and concludes that they are very suitable for widespread use.

4618. Steckiewicz, C. Czasowe (przenośne) leśne drogi metalowe. **[Temporary (portable) forest roads made of metal.]** *Sylwan* 104 (11), 1960 (47–51). 7 refs. [Pol.]

Compares several British and American perforated-sheet or metal-mesh units, which can be fitted together to form a road surface over muddy or boggy areas [cf. Great Britain, *F.A.* 20 p. 327].

4619. Kovalevskij, V. M., and Lahno, R. P. Uplotnennye snežnye avtomobil'nye dorogi. **[Compacted snow roads for [timber] lorries.]** *Lesn. Prom.* 1961 (2), (12–5). [Russ.]

A review of work by CNIIMĖ in 1959–60, describing and illustrating some Soviet implements: a snow harrow and a ribbed roller for mixing and loosening the snow, and a smoothing device, a roller, and a vibro-compacter for compacting it.

4620. Pablo. Snöpackade vägar. **[Compacted snow roads.]** *Skogen* 48 (6), 1961 (113–4). [Sw.]

Includes brief descriptions, with illustrations, of some equipment used, with some details of costs.

4621. Pieńkos, K. Wpływ róznych nawierzchni dróg leśnych na wydajność środków transportowych. **[Effect of various forest road surfaces on transport efficiency.]** *Sylwan* 104 (12), 1960 (53–62). 3 refs. [Pol.russ.e.]

A theoretical analysis of timber transport efficiency in relation to the type of road and road surface.

4622. Grehov, G. F. Issledovanie naprjaženij pri izgibe v ležnjah derevjannyh pokrytij avtomobil'nyh dorog. **[Investigations on the bending stresses in the wood in wood-surfaced lorry roads [for timber transport].]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (89–92). 3 refs. [Russ.]

An analysis of stresses occurring during the passage of various types of lorry over four different types of wood-surfaced road. [Cf. *F.A.* 21 No. 1906.]

4623. Grehov, G. F. K voprosu sohranenija drevesiny v dorožnyh pokrytijah avtomobil'nyh dorog. **[The problem of preserving timber used for lorry-road surfaces.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (70–7). 5 refs. [Russ.russ.]

Fungal attack in 4 types of standard wooden road surface was investigated in the Leningrad region. It was found that optimum conditions (of r.h., wood m.c., and temperature) for decay were not of long duration, this varying according to type of surface construction. Preservatives have not yet been used in this type of work in the U.S.S.R.

4624. Waldmann, G. Bodenklima und Bodenfrost in stabilisierten Waldstrassen. **[The climate of the soil, and soil frost, in stabilized forest roads.]** *Mitt. StForstverw. Bayerns* No. 31, 1960 (275–84). [G.]

In a road on a silty loam, stabilized with sand, lime, and tar, compaction resulted in homogenizing dry volume weights and heat conductivity, to a depth of 4–5 cm., and hence in a reduction of temperature tensions. The moisture content remained at 8–12% for most of the year, which was less than in the natural soil; depth of freezing depended greatly on it. Despite frequent freezing and thawing (27 changes at 20 cm. depth in one winter) no frost damage occurred. Permanent roads and bare soil suffered from frost heaving.

4625. Suslova, T. D. Laboratornye issledovanija po primeneniju torfjanogo furfurola dlja stabilizacii gruntov pri stroitel′stve lesovoznyh dorog. **[Laboratory investigations on the use of peat furfural to stabilize earth in building roads for timber transport.]** *Lesn. Ž., Arhangel′sk* 3 (4), 1960 (85–8). [Russ.]

The laboratory work indicated that furfural/aniline was a suitable stabilizing agent; results were best on clay-loam soil; adequate dosage was 2% [by volume?]; minimum time before acceptable strength and water-resistance were reached was 3 days. Field trials are now needed. [Cf. *F.A.* 21 No. 578.]

384. Protective Works, including Torrent Training

4626. Hohenthaner, F. Neue Methoden der Lawinenverbauung. **[New methods of avalanche control.]** *Allg. Forstzeitschr.* 16 (11), 1961 (209–12). 4 refs. [G.]

Discusses various structures, materials, etc. for containing or checking avalanches, or preventing their formation by altering snow drift, including the use of similar devices to provide suitable snow conditions for afforestation, and describes successful afforestation in an old, stabilized avalanche run under the protection of almost horizontal snow barriers, which could be folded back in summer to allow the young forest plants full enjoyment of light.

4627. Martinelli, M., Jr. **A look at avalanche control structures in Europe.** *Repr.* from *Proceedings, 28th Western Snow Conference 1960*, 1960 (67–70).

A brief description of the main structures used in France, Switzerland and Austria, including structures to protect seedlings from snow creep.

4628. **Snow avalanches: a handbook of forecasting and control measures.** *Agric. Handb. U.S. Dep. Agric.* No. 194, 1961. pp. 84. 10 refs.

4629. Heede, B. H. **A study of early gully-control structures in the Colorado Front Range.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 55, 1960. pp. 42. 20 refs.

Describes and evaluates gully-control structures installed 20–25 years ago in the Pike and San Isobel National Forests, shows the role of check dams in gully control and formulates principles and guiding rules.

385. Drainage, Irrigation, Sedimentation

See No. 4570.

4. FOREST INJURIES AND PROTECTION

41. General Technique of Forest Protection. Types of Injury

See also Nos. 4204–5.

4630. Buis, R. Influence chez les arbres, de l'âge des blessures sur leur cicatrisation. **[The influence of the age of wounds on trees on their healing.]** *C.R. Acad. Sci., Paris* 251 (4), 1960 (579–81). 1 ref. [F.f.] O.R.S.

Comparison of the healing of artificial wounds of different areas on *Platanus acerifolia, Acer platanoides, A. pseudoplatanus,* and *Tilia platyphyllos* showed that the rate of healing decreased during the second year from wounding and was less rapid for wounds in the same place as old scars. It varied with species.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

4631. Goss, D. W. **Windthrow in young plantations on ploughed heathland.** *Sylva, Edinb.* No. 41, 1961 (18, 27 + 1 plate).

Strong gales in Nov. and Dec. 1959 caused much windthrow in 8- to 10-year plantations of Lodgepole, Scots and Corsican Pine and Japanese Larch, planted either (*a*) on the ridge or (*b*) in the furrow. In places the proportion of trees thrown was as high as 90%, but all the (*a*) trees and the Japanese Larch were unaffected. A study was made of the root systems of 120 trees from 4 widely separated but equally exposed sites, and it was found that whereas (*a*) trees had developed well spread, vertical root systems descending to some depth, (*b*) trees had profuse roots only in the direction of the furrow. Any wind blowing across the furrows would therefore blow down (*b*) trees. Larch was saved from windthrow, even when furrow-planted, because of its adventitious root-system and its deciduous habit. Other points observed in the course of the investigation were that: (1) At the age of 8–10 years there is a direct relationship between shoot weight per unit height and root weight. (2) When the roots of Pines grow near the iron-pan they become curiously flattened and lose their growing points. (3) Excess of water inhibited root growth, and fluctuating water-tables appeared to produce a peculiar rooting habit, perhaps because the roots virtually died during very wet spells, only to grow again when the water receded. (4) Root competition from ground vegetation was not noticeable; Pine and Larch roots even grew through clumps of *Scirpus* and *Calluna* roots. It is concluded that ridge-planting, of Pines especially, is to be advocated for the present, if early windthrow is to be avoided. Trees planted on the ridges developed better roots because: (i) it is easier to make a deep planting notch in the ridges than in the loose soil of the furrow; (ii) their roots grow further in search of moisture, and extend downwards, thus providing adequate anchorage.

4632. Holubčík, M. O poškodení drevín vetrom a snehom v dňoch 8. & 9. I. 1959 v lesníckom arboréte v Kysihýbli pri Banskej Štiavnici. **[Damage to trees by wind and snow on 8 and 9 January, 1959 in the Kysihýbel arboretum near Banská Štiavnica.]** *Ved. Práce Výskum. Úst. Lesn. Hosp., Bansk. Štiav.* No. 1, 1960 (97–106). [Slovak.slovak.russ.g.]

The combination of wet snow, unfrozen ground, and a northerly wind (force 6) caused mostly selective damage, i.e. to individual trees with small crowns, or to suppressed trees, but also considerable damage to stands of *Thuja occidentalis*, *Juniperus virginiana* and, in part, to *Pinus flexilis*. Younger stands of *Chamaecyparis lawsoniana*, *P. nigra*, *P. rigida* and *P. nigra* var. *calabrica* also suffered badly. Other species, e.g. *Pinus peuce*, *Abies* spp., and *Picea* spp., proved resistant.

4633. DARAHVELIDZE, V. F. O pričinah vetroval'nosti drevostoev sosny krjučkovatoj (*Pinus sosnovskyi* Nakai) v Bakurianskom leshoze Gruzinskoj SSR. **[Reasons for the windthrow of *P. sosnovskyi* stands in the Bakuriani leskhoz, Georgian SSR.]** *Bot. Ž.* 46 (2), 1961 (241–7). 13 refs. [Russ.]

Records, and adduces reasons for, considerable windthrow of this usually windfirm species, in a 100- to 120-year stand (density 0·6, 1770 m. alt., on a S.E., 25° slope, soil 40–50 cm. deep).

4634. WEBB, L. S. **The results to date of the partial cutting experiment of 1949.** *For. Res. Note Causapscal For. Res. Sta.* No. 9, 1960. pp. 6.

Only 2·5% of the residual stand of Balsam Fir and Spruce trees of 4 in. d.b.h. and upwards remained standing 11 years after the partial cut was made; and nearly 60% of the trees blew down in the first two years. It is concluded that partial cutting in stands of merchantable pulpwood size in Gaspé is not advisable.

4635. BLUMENSTOCK, D. I., FOSBERG, F. R., and JOHNSON, C. G. **The re-survey of typhoon effects on Jaluitt Atoll in the Marshall Islands.** *Nature, Lond.* 189 (4765), 1961 (618–20). 3 refs.

Reports on a visit made 2 years after the typhoon. The tree species *Pandanus*, *Cocos*, *Bruguiera* and *Pipturus* have largely replaced themselves by seedling reproduction, whereas *Pemphis*, *Artocarpus*, *Terminalia*, *Pisonia* and *Cordia* have sprouted from the remains of plants damaged by the typhoon. *Scaevola* and *Tournefortia* have regenerated in both ways. Areas that were affected only by wind, rather than wind plus salt water, have produced a dense low forest or tall scrub in which *Pipturus argenteus* is a principal component.

4636. LUTZ, H. J. **Movement of rocks by uprooting of forest trees.** *Amer. J. Sci.* 258 (10), 1960 (752–6). 12 refs. O.R.S.

[Cf. *F.A.* 17 No. 3587.] When trees are uprooted by wind they may move, both vertically and horizontally, rocks having a volume of 50 cu. ft. and a weight of 4¼ tons. Uprooting of trees contributes to downslope movement of the soil and rock mantle and may initiate gully erosion. Some effects of this soil and rock movement resemble those resulting from periglacial frost-heaving. *From author's summary.*

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 4164–71, 4351, 4705–6, 4816–7.

4637. **Brooming of Narrowleaf Cottonwood [*Populus angustifolia*] and Aspen [*Populus tremuloides*] may result from winter injury.** *Extr.* from *Rep. Rocky Mt. For. Range Exp. Sta. 1960*, 1961 (18).

Superficially the brooms resemble brooms of parasitic origin, but it is suspected that they are regrowths following the killing of the original branches by severe spring frost. Brooms on both species are characterized by unusually large leaves, e.g. 7 in. long on Aspen vs. 2–3 in. for normal leaves.

4638. KNAPP, R. Einfluss von Spätfrösten auf verschiedene Pflanzen-Arten in Wäldern und auf Schlagflächen. **[The effect of late frosts on various species in forests and on clear fellings.]** *Wetter und Leben, Wien* 11 (8/10), 1959 (125–30). 8 refs. [G.g.] L.S.

Discusses and tabulates frost injuries on 5 clear-felled and 5 adjoining forest plots. In general, species typical of clear-felled sites, including pioneers like Hazel, Birch, or Aspen, suffered little or no damage, while many forest plants, including Oak, Beech, and Spruce suffered severely, particularly in the open. No relation appeared to exist between degree of damage and altitudinal or latitudinal range—*Vaccinium myrtillus*, for instance, showing severe injuries, and *Carpinus betulus* none.

4639. HESMER, H. Trocknisschäden an Fichtenbaumholzrändern in ihrer Bedingtheit durch Exposition, Schutz vorgelagerter Bestände und unterschiedliche Bemantelung. **[Drought damage to trees on the margin of Spruce stands approaching maturity, as conditioned by aspect, neighbouring stands and differences in crown depth.]** *Forstarchiv* 31 (6), 1960 (77–83). 13 refs. [G.g.]

The serious damage caused by the extreme drought of 1959 in Spruce stands approaching maturity on level, poorly drained sites in the Kottenforst was most severe on stand margins. Surveys showed that margins with an E. to S.W. aspect suffered above-average losses. Adjacent stands gave protection only when at least half the height of the Spruce. Margins with crowns reaching right down the tree suffered worse than those with open (short) crowns. Measures for restricting drought damage to susceptible species on such sites are outlined. *From author's summary.*

4640. REUTER, C. Hozzászólás a feketefenyö állományok megbetegedéséhez. **[A disease problem in *Pinus nigra* stands.]** *Erdö* 10 (3), 1961 (116–8). [Hu.g.russ.]

In the Kárász forest district, on the N.E. side of the Mecsek Mountains, considerable mortality occurred in 1948–49. Since there was a severe drought and similar symptoms in broadleaved species, deaths were ascribed to water shortage. The red-needled Pines were removed, and others recovered with the autumn rains. The injury is no longer apparent. That drought was the cause can be considered proved.

423. Precipitations

See also Nos. 4626–8, 4632, 4705.

4641. Cayford, J. H., and Haig, R. A. **Glaze damage in Red and Scots Pine plantations in South-eastern Manitoba**. *For. Chron.* 37 (1), 1961 (16–8, 20). 3 refs.

A study was made of recovery of young plantations after a severe glaze storm in Nov. 1958, in which 50–100% of young *Pinus resinosa* were bent till their tops touched the ground. *P. sylvestris* was less severely affected. One year later both species showed considerable recovery, and little or no permanent damage had occurred in plantations <14 or >25 years old. Ca. 25% of trees 16–22 years old in dense *P. resinosa* plantations were judged to be permanently damaged.

4642. Burton, J. D., and Gwinner, M. W. **Plateau Pines weather ordeal by ice**. *Sth. Lumberm.* 201 (2513), 1960 (106–8).

A study, on 126 plots in S. Tennessee, of the effects of a severe ice storm in March 1960 showed that severe damage was restricted to stand margins. Loblolly stands recently thinned for pulpwood, and Virginia Pine >25 years old suffered most. Only young stands of Shortleaf and White Pine suffered slight damage. By September, most bent trees had straightened up. Broken or uprooted trees did not recover.

4643. Davies, W. J. **Abnormal growth of Scots Pine following hailstorm damage**. *Quart. J. For.* 55 (2), 1961 (164–7).

The storm, in Aug. 1956, stripped off nearly all the needles of the current year's growth of Scots Pine, while Douglas Fir, Japanese Larch, and Corsican Pine were only slightly damaged. The Scots Pine will be allowed to grow on, but it is unlikely ever to produce stems of timber quality.

424. Soil Conditions; Erosion Effects

See also Nos. 4182–4, 4187, 4224, 4406, 4705, 4731.

4644. Avellaneda, M., and Nijensohn, L. Intoxicación salina en álamos y sauce álamos. **[Absorption of toxic salts by Poplars and Willows.]** *Suppl.* to *Idia* No. 1, 1960 (119–23). [Span.] C.G.B.

In order to investigate the possibilities of afforesting saline soils having a high water table, plantations were studied at "Campo Espejo" a few km. north-east of Mendoza in an undrained depression that receives effluents from the city's sewage system, and has a water table fluctuating between 80 and 90 cm. In plots of (1) *Populus nigra* var. *italica* cv. 'Sempervirens', (2) *P. alba* var. *pyramidalis* and (3) *Salix alba* var. *caerulea*, analyses were made of soil, soil water, and leaves from the trees. Symptoms of toxicity in the trees are also described. The results show that, whereas in (2) the quantitative aspect of accumulation of salts is most important, in (1) and (3) the specific toxic action of certain ions is most important. In necrotic leaves, chlorides always predominate. With an equal concentration of chlorides in the medium, (2) absorbs less than (1); the same is true of Na. In comparison with controls from good sites: (*a*) amounts of phosphates, sulphates and Mg are greater in all species from "Campo Espejo"; (*b*) in Ca content (1) has a lower, (3) a higher, and (2) an insignificant difference; (*c*) in necrotic leaves of (1) and (2) the % of K is higher, whereas in (3), although the dry parts of the leaf contain more K than the green parts, the amount never attains that found in one of the controls. It is not the salinity of the soil but that of the groundwater which is responsible for the accumulation of ions and the consequent symptoms of toxicity. There is no difference in the severity of symptoms in (1) in two plots having widely different soil values. Symptoms begin only when roots reach groundwater level. Symptoms in (2) increase in relation to increased content of total salts in the groundwater rather than with the salinity of the soil profile. The high % of chlorides, Na and, possibly, Mg in the groundwater and the lower soil profiles is the factor controlling the appearance of toxic symptoms. A distinct superiority in tolerance of saline conditions is shown by (2) and (3) compared with (1), which proved very susceptible. The greater tolerance of (2) in comparison with (1) is related to a lower absorption of salts in general, and of NaCl in particular, under the same conditions.

425. Chemical Influences (Atmospheric)

4645. Borsdorf, W. Beiträge zur Fluorschadendiagnostik. I. Fluorschaden-Weiserpflanzen in der Wildflora. **[Diagnosis of F damage. I. Wild plants as indicators.]** *Phytopath. Z.* 38 (3), 1960 (309–15). 6 refs. [G.g.e.] O.R.S.

The 59 species studied are divided into groups according to their susceptibility. *Carpinus betulus* is among the highly susceptible, *Acer platanoides* and *A. pseudoplatanus* among the susceptible, *Betula verrucosa*, *Quercus robur* and *Q. sessiliflora* among the slightly susceptible, and *Euonymus europaeus* among the resistant.

4646. Adams, D. F., and Emerson, M. T. **Variations in starch and total polysaccharide content of *Pinus ponderosa* needles with fluoride fumigation**. *Plant Physiol.* 36 (2), 1961 (261–5). 13 refs. O.R.E.

Fluoride fumigation of *P. ponderosa* needles resulted in an initial change in the concentrations of starch and non-starch polysaccharides. The data indicate that the Pine tends to adapt itself to F fumigations at 5–10 μg F^-/cu. m., when the exposure is intermittent. This is in contrast to the reaction of the plant to lower fumigation concentrations (0·5 and 1·5 μg F^-/cu. m.) of longer and more frequent duration and lower exposure factor. Foliage analysis for starch and total polysaccharide contents could not be used to determine whether any particular field-grown plant had been exposed to F fumigation.

4647. Wentzel, K. F. Wald und Luftverunreinigung. **[Forests and air pollution.]** *Jber. Dtsch. Forstver. 1960*, 1960 (156–78). [G.]

A lecture discussing injuries to forests, lasting destruction of vegetation, and loss of amenity in the Ruhr area, and the hygienic effects (screening, filtering, dispersal etc.) of trees and forests, and their limitations. In an example given, a Beech stand close to a lead smelter, while itself exhibiting higher SO_3 contents of leaves, higher Pb deposition on the soil and much lower mean heights and d.b.h. than a comparable stand 400 m. away, effectively protected a Spruce stand in its lee. When it was felled, the Spruce developed serious symptoms of smoke injury, and a 30-m.-wide border strip has already died.

4648. PAPRZYCKI, E. Wpływ zanieczyszczeń powietrza na lasy Górnośląskiego Okręgu Przemyslowego. **[Effect of atmospheric pollution on the forests of the Upper Silesian Industrial District.]** *Sylwan* 104 (12), 1960 (63–78). 32 refs. [Pol.russ.e.]

Discusses the types of atmospheric pollution, their effect on the vegetation, recognition of damage, and ways of limiting damage and of reducing economic losses. A national inventory of the forest areas damaged by atmospheric pollution is urged, and the setting up of a special station for research on the problem.

429. Injuries from Inorganic Agencies (Miscellaneous)

See No. 3972.

43. Forest Fires

4649. CHARTERS, H. **Fires in [U.K.] State forests in the years 1929–1956.** *For. Rec. For. Comm., Lond.* No. 45, 1961. pp. 37. Price 3*s*.

Gives tabulated statistics on incidence and loss by causes, years, months, time of day, sizes, ages, and periods, and scale of protection and loss per £100 and per acre at risk.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

See also No. 4655.

4650. **Moisture in leaves and twigs of chaparral differs.** *Extr.* from *Rep. Rocky Mt. For. Range Exp. Sta. 1960*, 1961 (34).

The moisture in leaves of chaparral Oak species differs sufficiently from that in twigs to make it desirable that they should be sampled separately in order to assess the flammability of Oak chaparral. Over the whole year, mean moisture in leaves is ca. 25% higher than in twigs; the difference is greater during wet than during dry periods. The m.c. of leaves and twigs is not correlated over short periods of time; on 2 days when it was determined periodically throughout the daylight hours, changes in leaves and twigs differed so greatly that the two were not significantly correlated.

4651. REIFSNYDER, W. E. **Seasonal variation in the moisture content of the green leaves of Mountain Laurel [*Kalmia latifolia*].** *For. Sci.* 7 (1), 1961 (16–23). 9 refs.

The moisture content—of interest in connexion with forest fuel flammability—was investigated over an 18-month period. Leaves from rocky shallow sites were consistently drier. Old leaves showed minima in May and maxima in late summer. Leaf m.c. was 100 and 140% of ash content during the spring and autumn fire seasons. No correlation of m.c. with drought was found. New leaves had a m.c. of 300% which fell to roughly that of previous years' leaves in ca. 2 months.

4652. CHANDLER, C. C. **Risk rating for fire prevention planning.** *J. For.* 59 (2), 1961 (93–6). 9 refs.

A discussion of the basic factors involved in calculating risk [S.A.F. Terminology]. The author refers to a new system of risk rating developed from these factors (e.g. weather, fuel types, prevention effectiveness) in California, of which details and results are to be published.

4653. PIRSKO, A. R. **Alinement chart for perimeter increase of fires.** *Fire Control Notes* 22 (1), 1961 (1–4).

The perimeter increase of a free-burning fire is an important value in fire-control planning. On the basis of the observed fact that a fire perimeter is usually 1½ times the circumference of a circle enclosing the same area, an alinement chart has been constructed, from which it is possible to read the perimeter increase (chains/hr.) of a fire when the time elapsed between origin and attack, and the area at the time of attack are known.

432. Prevention and Control

4654. FAUGÈRE, H. Situation actuelle du système de défense contre les incendies dans le massif forestier gascon. **[The present state of fire protection in the forests of Gascony.]** *Rev. for. franç.* 13 (3), 1961 (149–52). [F.]

4655. PIRSKO, A. R. **Selecting fire control planning levels by burning index frequencies.** *Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 55, 1961. pp. 7. 5 refs.

Describes a method of determining the base level of burning conditions for which a full-time fire control organization must be set up. For a given area a chart is prepared from records of the probable frequency of occurrence of each burning index. From this the frequency of 'easy', 'normal', and 'bad' days can easily be seen, and planning levels set to cover a specified % of days in the fire season. In California the planning level chosen is 90% frequency; the corresponding burning index is called the 'area base burning index'. Charts for 4 areas in California illustrate the variability of this base.

4656. FOURNIER, S. A., BOYCE, A. A., and DUVAL, R. **Development of a smoke generator for simulating forest fires.** *Pulp Paper Mag. Can.* 62 (3), 1961 (142–4, 146). 5 refs.

In work on the detection of forest fires, it was found that a Solo-Port insecticide sprayer with a fogging attachment and SAE 5W lubricating oil generates a smoke of desired colour, density and duration that will consistently rise above tree-top level. As it is easily portable, safe, economical, and can generate smoke for long periods, it is thought to be suitable for use in visibility studies, in helping to verify visibility maps, in training fire-tower observers and checking their efficiency, and also as a target for aerial observation.

4657. **Survival clothing for forest-fire fighters.** *Fire Control Notes* 22 (1), 1961 (5–8).

Tests showed that the simplest designs, the aluminized paper cones, gowns, and bags afforded more protection than complete suits. Paper-foil laminates were equal to, if not better than, expensive aluminized fabrics in the matter of reflectivity, and withstood higher temperatures. It is believed that paper-foil cones, bags etc. are sufficiently durable as an expendable protective garment for fire-fighters. Prone or sitting positions seem to offer the best chance for survival when trapped by fire.

4658. FENTON, R. H. **Toxic effects of a fire fighting chemical.** *J. For.* 59 (3), 1961 (209–10). 3 refs.

Draws attention to the toxic effects on vegetation of Na Ca borate. In a fire-fighting demonstration in Maryland, two aerial drops each of 450 gal. borate slurry were made over a hot slash fire after a *Pinus virginiana* seed-tree felling. One drop missed the fire; the other effectively retarded it. A year later, all 17 seed-trees (mean d.b.h. 11 in., height 60–75 ft.) and most young Pines on an area of 50 × 300 ft. where the slurry had fallen were dead. Ground vegetation was almost completely eliminated, but most small hardwoods were still alive, though some had discoloured foliage. In cases where a misdirected drop would do as much damage as the fire, e.g. in Christmas-tree plantations, seed orchards, experimental areas, standard fire-fighting techniques should be applied, using aerial drops of borate only in the last resort. [Cf. *F.A.* 22 No. 675.]

4659. BROCHOCKI, J. A. **Use of explosives for fire line construction.** *Pulp Paper Mag. Can.* 62 (Convention No.), 1961 (250, 252, 254).

Reviews a research project undertaken to develop a method of trenching with explosives, for fire-line construction. It is concluded that the best explosives are Primacord and 40% Forcite; the maximum cartridge spacing to obtain a continuous area of excavation is 30 in., using 40% Forcite cartridges of 1¼ × 8 in., sunk to a depth of 6–8 in. in the soil; the trenches made are ca. 18 in. deep by 28 in. wide, with mineral soil scattered ca. 8 ft. on each side of the trench. The field organization of work is discussed: allowing a time safety factor, with a 3-man crew, ca. 1 hr. is reckoned sufficient for 500 ft. in fire-control planning. Costs are 8.79 cents/ft. An example of the use of explosives in an actual fire-control operation is also described.

4660. KÖRTGE, W. Moderne Geräte und Mittel der Waldbrandbekämpfung. [**Modern forest-fire control implements and materials.**] *Forst- u. Holzw.* 16 (6), 1961 (131–4). [G.g.]

An account chiefly of the advantages in forest fire control of the model PG 12 duster (Saval, Holland) which blows 'ABC' extinguishing powder on to the fire with the aid of CO_2.

435. Benefits of Fire Control. Injurious Effects of Fire

See Nos. 3982–3, 4308, 4661, 4729–30, 5022.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 3982–3, 4309, 4312–3, 4319, 4544, 4665–6, 4729–30.

4661. LINDENMUTH, A. W., JR. **A survey of effects of intentional burning on fuels and timber stands of Ponderosa Pine in Arizona.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 54, 1960. pp. 22. 29 refs.

Ca. 27,000 acres of Ponderosa Pine in the Fort Apache Reservation were burned in Nov. and Dec. 1956, and data taken from 6666 observation points. Major changes in fuel and understorey were found only on the 23·3% of the area that was burned by hot surface or crown fire. Light surface fires occurred on 55·2% of the area, while 21·5% failed to burn. The presence of slash increased the intensity of the burn. The fire released from competition 24·3% of potential crop trees needing release. Offsetting this, the already insufficient quantity of potential crop trees was reduced by 10%, and a further 7·4% were damaged, while the area unstocked with crop or potential crop trees increased from 15·4 to 18·8%. Burning was carried out cheaply and with a minimum of controls. The possibility of using fires of controlled intensity among trees of a given size is discussed. Such control would greatly increase costs. [Cf. *F.A.* 19 Nos. 4364–5.]

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 4190, 4316, 4360, 4398, 4412–20, 4471–5, 4494–6, 4499–4514, 4532, 4542–6, 4560.

4662. **Biological control of Lantana.** *East African Farmer and Planter* 4 (3), 1959 (25). From *abstr.* in *Herb. Abstr.* 30 (2), 1960 (663).

In Zanzibar, introductions of *Teleonemia scrupulosa* completely defoliated *Lantana camara* and spread slowly into areas adjacent to those into which it was introduced. Where *L. camara* was killed, the area was rapidly recolonized by *Panicum trichocladum.*

4663. HOY, J. M. ***Eriococcus orariensis* Hoy and other Coccoidea (Homoptera) associated with *Leptospermum* Forst. species in New Zealand.** *Bulletin, Department of Scientific and Industrial Research, Wellington* No. 141, 1961. pp. 70. 50 refs. Price 10*s*.

A study was made of the life cycle of *E. orariensis* on *L. scoparium.* Apart from the entomogenous fungus *Myrangium thwaitessi*, there are no important predators or parasites of *E. orariensis* in New Zealand, and in a period of 10 years it has spread over most of the two islands, deliberately transferred by man in order to control *L. scoparium* on agricultural land. Its effectiveness for this purpose has declined in the presence of *M. thwaitessi*, which probably arrived in New Zealand in association with the insect, but had little effect on it until it was transferred to higher-rainfall areas. *L. ericoides* is apparently resistant to *E. orariensis*, presumably because its smooth bark offers fewer crevices, and the complete exfoliation of the surface layers of bark from time to time limits population increase of the insect. Consideration should now be given to the introduction of other species of *Eriococcus*, and other Coccoidea, some of which are listed and discussed.

4664. PRINGLE, W. L. **The effect of a leaf feeding beetle on Big Sagebrush in British Columbia.** *Proc. Jt. Mtg. 16th Nth. Cent. & 10th West. Canad. Weed Control Conf.* 1959 (21). From *abstr.* in *Weed Abstr.* 9 (11), 1960 (2027). O.W. (Also in *Journal of Range Management, Portland* 13 (3), 1960 (139–42).)

An investigation over 4 years showed that up to 50% of mature *Artemisia tridentata* may be killed in 1 season. Sage used as aphid pasture by ants survived. Attempts to move beetles to other areas of infestation have so far failed; the insect is taxonomically native to the area. Many injured plants recovered, especially if immature. Proper range management is an essential accompaniment of this method of control.

4665. POND, F. W., and CABLE, D. R. **Effect of heat treatment on sprout production of some shrubs of the chaparral in central Arizona.** *Repr.* from *Journal of Range Management, Portland* 13 (6), 1960 (313–7). 7 refs.

Stems of 7 chaparral species, (*a*) *Quercus turbinella*, (*b*) *Rhus trilobata*, (*c*) *Garrya wrightii*, (*d*) *Rhamnus crocea*, (*e*) *Ceanothus greggii*, (*f*) *Arctostaphylos pungens*, and (*g*) *Aplopappus laricifolius* were burned off at ground level with a blowlamp on replicated plots, with intervals of 1, 2, 3, 4, and 5 years between treatments. Findings were as follows: the number of stems of (*a*) was reduced after 5 annual burns, but increased by less frequent burning; (*b*) also was hard to kill; (*c*) and (*d*) were easier to kill than (*a*) and (*b*), but must be burned at least twice within 3 years to be eliminated; old plants of (*e*), (*f*), and (*g*) were killed by one burn. It appears that reduction by repeated burning of the less desirable species such as (*a*) and (*b*) would be impracticable. The burning would tend to reduce or eliminate species preferred by deer and livestock, e.g. (*c*), (*d*) and (*e*), rather than the undesirables.

4666. **A study of effects of frequency of burning and slashing in controlling M'sasa-M'nondo coppice.** *Extr.* from *Report, Grasslands Agricultural Research Station, Marandellas, S. Rhodesia* 1957 (38). A.P.B.

In an experiment started in 1952 on land cleared of *Brachystegia spiciformis* and *Isoberlinia globiflora* [cf. *F.A.* 20 No. 1984], burning once a year in October reduced the vigour of the coppice, but coppice burned only every 4 years returned strongly. The effect was improved by slashing to ground level in the April preceding burning.

4667. **A study in tree-poisoning.** *Report, Grasslands Agricultural Research Station, Marandellas, S. Rhodesia* 1957 (42–4). A.P.B.

[Cf. *F.A.* 20 No. 1985.] Stump treatments with As_2O_3 (64% in water), at 16 ml. per in. of girth, killed 65% of *Brachystegia spiciformis* and *Isoberlinia globiflora* combined, and frill treatments (5 ml. per cut) 38%. In subsidiary stump trials 60% mortality of *B. spiciformis* was obtained by 5 c.c./in., and of *I. globiflora* by 12 c.c./in., though, for most treatments tried, the former proved more resistant.

4668. SEELBACH, E. **Portable mist blowers for chemical brush control.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (173–6). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1436). O.W.

A brief account of their use from 1955 to 1959. Two models found satisfactory are the Kiekens Dekker KWH-75 Knapsack Mist Blower (Dutch) and the Fontan (German).

4669. **Foliar application of chemicals to weed tree species.** *Technical Service Data Sheet, Amchem Products Inc., Ambler* No. *E*-159, 1960. pp. 8. 41 refs. From *abstr.* in *Weed Abstr.* 9 (11), 1960 (1982). O.W.

Factors concerning the mechanism of absorption, translocation, and effect of 2,4-D and 2,4,5-T are reviewed. The oil-soluble amines of these chemicals give excellent results when applied to the leaves of woody weeds as emulsions in water. The invert emulsion, however, caused such rapid destruction of foliage that translocation to the roots was insufficient to prevent regeneration. Application should take place when movement of plant nutrients is downward, i.e. after the leaves are mature. Tractor-mounted mist blowers provide control of brush in the forest, using 2 lb./acre oil-soluble amine of 2,4-D and 2,4,5-T in 3–5 gal. water. Penetration is more rapid and complete if a low-pH ester is used, and there is less risk of damage to the conifers.

4670. GRUNDY, W. M., and BENNETT, J. M. **Aerial application of herbicides for right-of-way brush control.** *Ontario Hydro Research News* 12 (1), 1960 (13–7). From *abstr.* in *Weed Abstr.* 9 (11), 1960 (1989). O.W.

The development of aerial spraying is reviewed. Helicopters have been found superior to fixed-wing aircraft, owing to their greater manoeuvrability; 40–50 gal. are carried, delivered to 150-ft.-wide rights-of-way from two 11-ft. booms; and to 100-ft.-wide rights-of-way from an 18-in. stub boom. A 1/1 mixture of low-volatile esters of 2,4-D and 2,4,5-T at 4 lb./acre in 7 gal. spray gives adequate control of deciduous brush; for conifers, TCA at 26 lb./acre in 7 gal. is necessary, using diesel oil as the diluent, or water in areas where transport of oil is difficult. Spraying is carried out from a height of ca. 150 ft. at 30–35 m.p.h., and conditions of absolute calm are essential to avoid drift. The cost is about $22/acre, as against 26 for spraying with ground equipment.

4671. CATTIS, J. L., and MANN, R. A. **Use of helicopter for chemical brush control by Tennessee Valley Authority.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (100–4). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1438). O.W.

A general account. In 1958 helicopter spraying in July with 2,4,5-T (esters) at 4 lb./acre in 4 gal. oil or water gave good control of *Nyssa sylvatica*, *Liriodendron tulipifera*, *Robinia pseudoacacia*, *Prunus* sp., *Sassafras albidum*, *Rhus copallina* and *Diospyros virginiana*, fair control of *Quercus prinus* and *Cercis canadensis*, and poor control of *Acer* sp., *Oxydendrum arboreum*, *Pinus* sp. and Cedar [? *Juniperus* sp.].

4672. **Amitrol, benzac and combinations of both for control of woody plants**. *Technical Service Data Sheet, Amchem Products Inc., Ambler* No. *H*-79, 1960. pp. 5. 11 refs. From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1454). O.W.

Presents a list, compiled from published and unpublished work, of woody plants susceptible (i.e. kill of 85% of the stem, with little or no regrowth after 2 growing seasons) to various rates of Amizol (90% active water-soluble formulation of amitrol), Benzac 1281 (2 lb./gal. triethylamine salt of 2,3,6-TBA) or a mixture of the two. Results from unpublished work were: *Acer macrophyllum* and *Rubus* spp. susceptible to Amizol 4 lb./100 gal.; *R. spectabilis*, *Alnus rubra*, *A. macrophyllum*, *Salix* spp., *Tsuga heterophylla* and *Abies grandis* susceptible to Benzac 1281 4 lb./100 gal.

4673. **Amizine and other amitrol-simazin combinations for weed control in woody plants**. *Technical Service Data Sheet, Amchem Products Inc., Ambler* No. *H*-80, 1960. pp. 8. 5 refs. O.W.

Amizine (15% amitrol + 45% simazine) applied in April at 2, 4, 6, and 8 lb./acre in woody plant nurseries gave effective control of weeds, lasting until the autumn frosts, with negligible or no damage to nursery stock. Post-emergence treatments with simazine at 4 lb. + amitrol 3 lb./acre also gave excellent results in Maple nurseries. In plantations of *Pinus sylvestris*, *P. nigra*, *P. virginiana*, *P. strobus*, *Cornus florida*, Peach, and Apple, amizine applied in June at 4 lb./acre did no damage to the trees and controlled all weeds satisfactorily except *Andropogon virginicus* (30% control) and *Viola* spp., which sprouted from buried rhizomes in August. Amizine at 8 lb. gave 50% control of *A. virginicus* and at 4 lb. gave 80% control of weeds round ornamentals, without serious damage to the trees and shrubs.

4674. **The use of simazine as a weedkiller in woody crops such as nurseries, ornamental trees and shrubs, forest nurseries**. Pest Control Department, J. R. Geigy S.A., Basle. 1959. pp. 20. O.W.

Among the woody species susceptible to simazine are: *Abies homolepis*, *Larix decidua*, *Pinus nigra* var. *caramanica*, *Pseudotsuga taxifolia*, *Betula pubescens*, *Tilia cordata*, *T. platyphyllos* and *Fraxinus aurea*. Recommendations are given for testing simazine for control of weeds in more than 300 woody species.

4675. KOZLOWSKI, T. T., and KUNTZ, J. E. **Effect of simazine on Red Pine seedlings of various ages**. *For. Res. Note Wis. Coll. Agric.* No. 62, 1960. pp. [3].

Simazine was sprayed in a water suspension at (*a*) 1 lb. and (*b*) ½ lb. active ingredient/acre on replicated plots in Plainfield sand 7, 14, and 18 weeks after sowing with *Pinus resinosa*. Germination took place over several weeks. With (*a*), only recently germinated seedlings were damaged. The longer the delay in treatment after sowing, the greater the number and dry weight of seedlings per plot obtained at harvest after 23 weeks, as there were fewer seedlings at the susceptible stage. Application after 18 weeks gave a 50% increase in dry weight per plot over that obtained with application after 7 weeks. Seedling number and dry weight were greater on weed-free control plots than on herbicide-treated plots. Generally similar effects were noted with (*b*), though it inhibited dry weight production less than (*a*). Mean dry weight per seedling decreased as simazine application was delayed, apparently because of competition between seedlings at highest density.

4676. KUNTZ, J. E., and KOZLOWSKI, T. T. **The effect of atrazine on seed germination and subsequent growth of coniferous seedlings**. *For. Res. Note Wis. Coll. Agric.* No. 63, 1960. pp. 3. 1 ref.

(1) Flats of Plainfield sand were sown with *Pinus resinosa* seed, and immediately sprayed with atrazine (1, 2, and 4 lb. active ingredient in 300 gal. water/acre) as a pre-emergence treatment. Each treatment was replicated thrice. Germination began after 14 days and was high at all doses, not differing significantly from germination on untreated flats. Atrazine, however, adversely affected seedling growth and caused varying degrees of mortality. One month after germination, 100% of seedlings in flats treated at 4 lb./acre were dead, and 50% at 1 lb./acre. (2) Atrazine was applied at similar rates to *P. resinosa* seedlings after emergence, and to emerging *P. strobus*, in (*a*) flats containing Plainfield sand and (*b*) flats containing composted silt-loam greenhouse soil. One month after treatment, all *P. resinosa* seedlings were dead on (*a*) and (*b*) at all rates. For *P. strobus*, the %s killed on (*a*) and (*b*) respectively were, at 4 lb./acre, 90 and 82; 2 lb./acre, 91 and 67; and 1 lb./acre, 33 and 55. The seedlings that emerged before treatment suffered less than those emerging after treatment. Flats were resown with oats one month after spraying, and again after a further 6 weeks; germination was rapid, with no apparent detrimental effect from treatment, but the oats in all treated flats died with both sowings. This indicated the persistence of triazine herbicides in Plainfield sand even after repeated watering. [Cf. *F.A.* 22 No. 437.]

4677. HILTON, H. G., HAERTL, E. J., and DAVIDSON, J. H. **Preliminary observations on the use of Silvex granules for brush control on rights-of-way**. *Proc. Jt. Mtg. 16th Nth. Cent. & 10th West. Canad. Weed Control Conf.* 1959 (40–1). From *abstr.* in *Weed Abstr.* 9 (11), 1960 (1986). O.W.

Kuron granules containing 20% Silvex (2,4,5-TP ester) at 100 lb./acre compared favourably with 2,4,5-T (ester) [rate not given] when applied before cutting in autumn, but were more effective when applied in spring after cutting. In the latter case, stumps of <8 in. diam. showed very little regrowth 7 months later, and there were virtually no *Sassafras albidum* or *Robinia* sp. seedlings.

4678. **Woody plants.** *Res. Rep. West. Sect. Nat. Weed Comm. Can.* 1959 (76–7). From *abstr.* in *Weed Abstr.* 9 (6), 1960 (1035). O.W.

Control of crested wheat grass [*Agropyron cristatum*] growing under Ash trees was given by dalapon 15 lb./acre (excellent, but *Taraxacum* spp. increased), dalapon 15 lb. + amitrol 8 lb./acre, and amitrol 12 lb./acre (but regrowth occurred after 12 months); amitrol + NH_4SCN 4 lb./acre gave some control. Severe injury to Ash occurred with dalapon 20 lb./acre (in dry weather the injury was not apparent until after heavy rain) and with dalapon 15 lb. + amitrol 8 lb./acre. Dalapon 15 lb. or amitrol 8 lb./acre did not injure Spruce. Tests in June 1958 to eradicate *Caragana arborescens* 12 ft. high showed that the effect of 2,4,5-T (iso-octyl ester) 4 lb./acre in 100 gal. was greater than 2,4-D (butoxy ethanol ester) 4 lb./acre in 100 gal. water; better results were obtained by spraying entire plants than by spraying 1-ft. stumps carrying regrowth. By autumn 1959, new shoots appeared at the base of the uncut plants. Dalapon 60 lb./acre in 100 gal. water gave complete kill with no regrowth by autumn 1959. NH_4 sulphamate 50 lb./acre in 100 gal. and soil treatments with 2,4-D (granular) 8 lb./acre and fenuron (pellets) 6 lb./acre were ineffective. In brush control experiments on sandy loam soil, Dybar (25% fenuron) was applied in mid-June, mid-July and mid-September. By mid-September rates of 48–64 lb./acre gave good brush control and caused severe injury to grasses; 16 lb./acre and 32 lb./acre injured both brush and grasses. Rainfall was slightly above normal. Species present were:—*Prunus melanocarpa*, *Corylus cornuta*, *Amelanchier alnifolia*, *Quercus* sp., *Crataegus* sp., *Populus tremuloides* and *P. balsamifera*.

4679. **Undesirable woody plants [6 reports].** *Res. Progr. Rep. West. Weed Control Conf.* 1960 (19–24). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1453). O.W.

Experiments in the selective control of *Artemisia tridentata* growing among *Purshia tridentata* showed the former's greater susceptibility to 2,4-D or 2,4,5-T (3 lb./acre); *P. tridentata* was more susceptible to 2,4,5-T than to 2,4-D. Both species were most susceptible to June spraying. Kill of *A. tridentata* by aerial spraying with 2,4-D was greater at 10 ft. than at 50 ft. Comparisons of (*a*) areas showing 100% control of *A. tridentata* with (*b*) untreated areas, revealed that (*a*) held snow longer in spring than (*b*), and the soil moisture at 18–19 in. depth in June, July and Aug. in (*a*) was 63·8–30·2% greater than in (*b*). By May 1959 good control of *Quercus douglasii* had been given by 2,4-D PGBE (propylene glycol butyl ether ester) at 2 lb. acid equivalent (a.e.) applied in May 1955 and 1957, and by 2,4,5-TP PGBE at 2 lb. a.e./acre applied in May 1955, June 1956, and May 1957; similar control of *Rhus diversiloba* was obtained by 2,4,5-TP PGBE at 2 lb. a.e./acre applied in May 1955, 1956 and 1957. The 2,4,5-TP (acid) treatments killed some *Q. wislizenii*; 2,4-D and 2,4,5-TP PGBE at 2 lb. a.e./acre were much less effective on this species, and damaged *Pinus sabiniana*. In general, the effectiveness of follow-up spraying was greater in May than in June. Amine formulations were ineffective. The % kill of *Tamarix* spp. in Oct. 1959, after treatments in July 1958 at 20 lb./acre, was: fenuron 88%, monuron 47%, polychlorobenzoic acids 42%, 2,3,6-TBA 53%, and 2,4-D (acid) 45%. The rates of fenuron affecting *Q. turbinella* were 8 lb./acre (old and mature plants), and 16–64 lb./acre (coppice growth on burned areas).

4680. **Weeds and brush in non-crop land. (a) Roadsides and rights-of-way.** *Res. Rep. East. Sect. Nat. Weed Comm. Can.* 1959 (92–4). From *abstr.* in *Weed Abstr.* 9 (6), 1959 (998). O.W.

2,4,5-TP (5–6 lb./acre) in 125–150 gal. water applied in June 1956 gave 75% kill of *Acer saccharum* 6–10 ft. high. Regrowth from the root-collar zone in the survivors was observed in 1958. Fenuron pellets on a 5 × 5-ft. lattice at 6 g./site or at 14–15 g./tree in June 1958 caused slight damage to *Crataegus* spp., *Cornus* spp. and Apples on gravelly loam or gravelly clay loam but by Aug. 1959 all had recovered. In July 1959, following spraying in 150 gal. water in July 1957 and 1958, the weed (including brush) control on roadsides by Atlacide (60% $NaClO_3$) at 50 lb./acre + 2,4-D 2 lb./acre was slightly greater than Atlacide at 100 lb., and both were better than 2,4-D (amine) at 4 lb. or 2,4-D + 2,4,5-T at 2 lb. Weed control by diquat (1,1′-ethylene-2,2′-dipyridylium dibromide) at 4 lb./acre after 1 year was greater than by diquat at 2 lb. + 2,4-D at 4 lb., and equalled that given by Atlacide.

4681. **The control of weeds and woody plants in rights-of-way and other industrial sites. [6 reports.]** *Abstr. 1960 Mtg. Weed Soc. Amer.* 1960 (17–20). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1462). O.W.

Top kill of brush by 2,4,5-T (ester) 6 lb./acre acid equivalent in 100 gal. oil in October was greater than by polychlorinated benzoic acids (ester) plus 2,4,5-T. The cane broadcast [over-all application to stems of low brush when leafless] plus ground method of application gave better control of coppicing species e.g. *Robinia pseudoacacia*, *Rhus vernix* and *Sassafras albidum* than the cane broadcast, basal, or basal-plus-ground methods. Establishment of *Coronilla varia* on highway slopes gave complete and permanent weed control and highly effective erosion control with zero maintenance. No one chemical gave season-long control of vegetation of railway roadbeds but repeated low rates of some combinations were effective. Good brush control resulted from late winter and early spring applications of fenuron at rates depending on soil type. Results of vegetation control on uncropped ground by granular or liquid monuron and fenuron trichloroacetates are summarized.

4682. MERRIFIELD, R. G., and HANSBROUGH, T. **The use of urea herbicidal poisons in the eradication of undesirable hardwoods.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (212). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1448). O.W.

Fenuron pellets broadcast at 12 lb./acre gave 75% kill. Poor kill resulted from monuron, diuron and fenuron wettable powder formulations (4–12 lb./acre) applied in 1-ft. strips, 6 ft. apart, from monuron pellets broadcast at 12 lb./acre, and from fenuron wettable powder broadcast at 10 lb./acre.

4683. PRESCOTT, L. H. **Small-plot studies on right-of-way brush control with combinations of TCA and certain substituted urea compounds.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (91–4). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1464). O.W.

In brush control experiments, fenuron-trichloroacetate (1) or fenuron gave more rapid kill than monuron-trichloroacetate (2) or monuron formulations. The % control after 12 months by the following treatments was: (1) liquid concentrate 21 lb./acre (30 ml. injections in a grid pattern on 7-ft. centres), 95%; pellets (22% active) 18 lb./acre, 75%; fenuron pellets (25% active) 20 lb./acre, 80%; (2) pellets (22% active) 20 lb./acre, 76%; and monuron 80% wettable powder 20 lb./acre, 60%. Surface run-off of granular formulations was not significant. The main species controlled were *Quercus* sp., *Carya* sp., *Acer* sp., *Cornus* spp. and *Pinus echinata*; *Oxydendrum arboreum* was not susceptible to the treatments.

4684. ANDREWS, H., and RICHARDS, R. F. **Brush control with the substituted ureas.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (105–8). 2 refs. From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1439). O.W.

Monuron applied as a dust at 48 lb./acre in March to woody species on a Hartsells loam soil, gave 100% control of *Quercus velutina*, *Q. marilandica* and *Q. stellata*, 62% control of *Oxydendrum arboreum*, 50% of *Rhus* sp., 25% of *Carya* sp. and no control of *Acer rubrum*; 24 lb./acre was less effective except against *Q. alba* (100% control, and 12 lb./acre 75%) and gave no control of *Sassafras albidum*. On a fine sandy loam, monuron, diuron and fenuron applied in September as dusts at 4, 8 and 12 lb./acre were seen after 2 years to be ineffective against brush composed predominantly of *Robinia pseudoacacia*, *Liquidambar styraciflua*, *Carya* sp., *Quercus* sp., *O. arboreum*, *Diospyros virginiana*, *Rhus* sp., *Acer* spp.

4685. GONZALEZ, F. E. **Industrial brush control with fenuron pellets.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (89–90). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1440). O.W.

The rapidity of root kill of brush species by fenuron pellets was greater on sandy than on heavy soils and greater with spot than with broadcast treatments. The latter temporarily reduced the ground vegetation. Treatments at any time of the year were effective. More than 90% root kill of all species resulted by the end of the second growing season. The more susceptible species, e.g. *Celtis* sp., *Robinia pseudoacacia*, *Ulmus* sp., *Pinus* spp., *Acer rubrum*, *Liquidambar styraciflua* and *Quercus* spp., usually show chlorosis and defoliation within 30–60 days, while the less susceptible spp. e.g. *Melia azedarach*, *Oxydendrum arboreum*, *Fraxinus* sp., *Liriodendron tulipifera*, Bay and *Juglans* sp. may not reach maximum for 2 years after treatment.

4686. HERRON, J. W. **Additional observations on the control of woody plants with pelleted herbicides.** *Proc. Jt. Mtg. 16th Nth. Cent. & 10th West. Canad. Weed Control Conf.* 1960 (38–9). O.W.

Gives the results of experiments in broadcast application of fenuron pellets at various rates and of 2,3,6-TBA, with and without fenuron. More than 10 lb./acre fenuron may be required for good control of some hardwoods. The 25% and 50% formulations of fenuron gave similar results. 2,3,6-TBA was relatively ineffective alone. On heavy clay soil, applications of fenuron on May 4 were more effective during the first growing season than those made on May 19. Although ground cover was reduced on some plots, herbaceous growth persisted in all plots 4 months after treatment. Species most resistant to fenuron were *Sassafras albidum*, *Fraxinus americana*, *Juglans nigra*, *Kalmia latifolia* and *Cornus florida*.

4687. DARROW, R. A. **Pelletized and granular herbicide tests for woody plant control.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (118–20). 1 ref. From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1441). O.W.

The influence of rainfall and soil texture on the effect of fenuron pellet application for the control of *Quercus stellata* and *Q. marilandica* is discussed and some results quoted. Under favourable moisture conditions, 3–6 lb./acre in spring or early summer gave only partial control of *Ilex vomitoria*, whereas monuron at 6 lb./acre has occasionally given 80–90% root kill on fine sandy loams. Both fenuron at 3 and monuron at 6 lb./acre, applied in late spring, gave good top-growth control but only limited root kill of *Acacia farnesiana*; January treatments were ineffective. On limestone soils, fenuron at 6 lb./acre has controlled *Q. virginiana* and *Q. undulata*, and on a sandy soil has shown 60–70% root kill of *Q. virginiana* [?], but 4 lb./acre was ineffective. Preliminary tests indicate that 2 or 3 tablespoons/plant may be needed to control *Diospyros texana*. 2,3,5-TBA (granular) 8–9 lb./acre, applied in the dormant season, has caused growth inhibition and partial kill of *Q. stellata* and *Q. marilandica* but is much less effective when applied during spring or early summer; 4–8 lb./acre has given partial kills of *I. vomitoria* and *Ulmus alata*; rates up to 9 lb./acre have been ineffective against *Q. undulata*, and *Q. virginiana*; 4 lb./acre caused 80–85% defoliation of *Juniperus* sp. 1 year after treatment. Small plants of *Juniperus* sp. have been controlled by 1–2 oz./plant, and small plants of *Rosa bracteata* by 1 or 2 tablespoons/plant applied in mid-winter, but broadcast applications on mowed roses have been effective only at 8–9 lb./acre.

4688. CRONIN, E. H. **Effects of monuron on *Halogeton* and associated salt-desert shrub vegetation.** *Weeds* 8 (2), 1960 (168–72). 14 refs. From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1460). O.W.

Monuron at 0·5–8 lb./acre was applied under perennial shrubs along roadsides in an attempt to prevent the spread of *Halogeton glomeratus* by seed. The desirable perennials *Artemisia tridentata*, *A. nova*, *A. spinescens*, *Atriplex confertifolia* and *Kochia americana* were greatly reduced and the spread of *Halogeton* increased; invasion by *Chrysothamnus viscidiflorus* also occurred. The higher the rate of monuron the more damaging was its effect.

4689. GUNN, J. S., and TATHAM, P. B. **Diquat as an arboricide.** *Nature, Lond.* 189 (4767), 1961 (808–9). 2 refs.

Describes the first use of this new desiccant and herbicide [cf. *F.A.* 22 No. 4680] against trees. It was applied in the ground near the stems of Oil Palms in the rainy season, and trees given ≥40 g. were killed in ca. 6 weeks.

4690. MCCALEB, J. E., HODGES, E. M., and DANTZMAN, C. L. **The response of Saw Palmetto to several herbicides.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (113–7). From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1450). O.W.

The effects on living buds and canopy cover of dalapon (20 lb./acre), 2,4,5-T, 2,4,5-TP (both 4 lb./acre), 2,4-D (6 lb./acre) and erbon (120 lb./acre) in 100% oil or water or a 50/50 emulsion are tabulated, along with the effects of 2,4,5-T (butoxyethanol ester) at 2–4 lb./acre in water, or a 9/1 water/oil emulsion. Dalapon and erbon gave the best control, but damaged the forage plants excessively. The other compounds gave variable results, but 2,4,5-T and 2,4,5-TP appeared more effective than 2,4-D.

4691. GRELEN, H. E. **Seasonal foliage applications of 2,4,5-T on Saw-Palmetto.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (109–12). 1 ref. From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1451). O.W.

Repeated mechanical clearing of *Serenoa repens* did not prevent coppicing and was costly. 2,4,5-T (propylene glycol butyl ether esters) 0·5–5 lb. acid equivalent (a.e.)/100 gal. in 10% diesel oil + 90% water, applied each month from January to September inclusive, was most effective when applied in April and least when applied in June. (Flowering and fruiting occur from May–June.) January, and then March were the next best times of application. The best kill (78%) was given 1 year after treatment by 5 lb. a.e./100 gal. in April; 3·5 lb. a.e./100 gal. in April gave 72% and was probably the most economic treatment. There was no significant difference between the two esters. Rainfall and temperature data failed to account for the monthly variations in response.

4692. PLUMB, T. R., and BENTLEY, J. R. **Rate of broadcast 2,4-D spraying on second-year Chamise [*Adenostoma fasciculatum*] sprouts.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 163, 1960. pp. 7.

On an area in Mendocino National Forest burned in April 1956, sprouts in their second year of growth were sprayed with phytocides in May 1957. Low-volume sprays proved ineffective. The heaviest dosage used, 5·2 lb. acid equivalent of chemical in 26 gal. emulsion per acre, was the only one of 4 treatments that promised adequate kill of vigorous sprouting plants with dense crowns. Low-volatile ester of 2,4-D alone appeared to be as effective, dosage for dosage, as a 2,4-D/2,4,5-T mixture. [Cf. *F.A.* 21 No. 1953.] *From authors' summary.*

4693. PEEVY, F. A. **A comparison of different placements of 2,4,5-T ester applied as a basal spray for control of Blackjack Oak.** *Proc. 13th Ann. Sth. Weed Conf.* 1960 (200–4). 6 refs. From *abstr.* in *Weed Abstr.* 9 (8), 1960 (1467). O.W.

2,4,5-T (propylene glycol butyl ether ester) in diesel oil was variously applied to *Quercus marilandica* in May 1958 and March 1959 and results assessed in Sept. 1959. Top kill % and % trees with coppice shoots respectively were: (*a*) spraying the lower 2 in. of stem and wetting soil in a 4-in. band around the base, 92 and 5; (*b*) spraying the lower 12 in. of the stems only and protecting the soil, 92 and 7; (*c*) spraying the lower 12 in. by conventional method, 100 and 13; (*d*) spraying a 12-in. band of stem starting 4 in. above ground and protecting the lower parts, 68 and 62; and (*e*) protecting stem and roots and spraying 6 in. wide band round the base, 25 and 4.

4694. MOSER, T. H. **What has been done about Salt Cedar at Caballo Reservoir?** *Reclamation Era, Washington, D.C.* 46 (2), 1960. From *abstr.* in *Weed Abstr.* 9 (9), 1960 (1632). O.W.

Describes work over a 2-year period to eliminate *Tamarix gallica* from 5500 acres. Large plants were cleared by 84-in.-diam. rotary cutters plus crawler tractors equipped with root rakes. Aerial spraying with 2,4-D (Na) in oil and water caused defoliation and some top-kill, but failed to eradicate mature plants. Methods used for control of regrowth were (*a*) rotary cutting at yearly intervals, (*b*) spraying with 2,4-D, 2,4,5-T or 2,4,5-TP formulations. Following these treatments, native grasses—mainly Bermuda and salt grass—spread, to provide almost continuous cover of the cleared area.

4695. ROBERTSON, J. A. **Chemical control of *Eucalyptus* regrowth.** *J. Aust. Inst. Agric. Sci.* 26 (4), 1960 (367–9). 2 refs. O.R.E.

Trials were made, on *E. rossii* regrowth 1½–2 ft. high, with foliar sprays of the butoxyethanol ester of 2,4,5-T (2·5 and 5 lb./acre); a 2 : 1 mixture of the butoxyethanol esters of 2,4-D and 2,4,5-T (2·5 and 5 lb./acre); and Ammate (6·25, 12·5, 25, 50, and 100 lb./acre) with and without a liquid detergent; for all, the volume applied was 100 gal./acre. Spraying in April reduced the Eucalypt population considerably, but June spraying was ineffective. The mixed esters were the most successful; 2,4,5-T alone was also good, especially at the higher rate; Ammate was good at the higher rates when used with a wetting agent.

4696. Ormangülü (*Rhodendron ponticum* L.) ile mücadele ve tabiî tensilin denemeleri. **[Studies on regeneration in areas covered by *R. ponticum* and its control.]** *Extr.* from *Orm. Araşt. Enst. Yıl. Bült.* No. 8, 1959 (11–4, 52–5). [Turk.e.]

Three series of experiments were laid out in 1955–58 on the effects of cutting, uprooting, or spraying with different concentrations of 2,4-D or 2,4,5-T. Preliminary observations in 1959 of results on mortality of *R. ponticum*, humus formation and natural regeneration of tree species are summarized. *From author's summary.*

4697. SZATALA, Ö., TARJÁN, L., and BARCZA, R. Vegyszeres védekezés sarjak és tenyészteni nem kívánt fafajok ellen. **[Suppression of coppice shoots**

[of Robinia] and unwanted species.] *Erdö* 10 (3), 1961 (116–8). [Hu.g.russ.]

Spraying 2-year coppice with 0·5–1% Dikonirt (2,4-D ester) killed only the shoot terminals. Treatment of 1-year coppice with higher concentrations of Tributon (2,4-D + 2,4,5-T esters) was completely successful. It failed, however, with 4-year coppice. The most effective treatment of Robinia coppice is by painting the cut surfaces of the stumps immediately after felling with a mixture of herbicides in dieselene.

442. Parasitic (Higher) Plants. Epiphytes. Climbers

See also No. 4500.

4698. SRINIVASAN, A. R., and SUBRAMANIAN, C. L. **A review of literature on the phanerogamous parasites.** Indian Council of Agricultural Research, New Delhi. 1960. pp. 96, 16 pp. of refs.

Covers world literature and is arranged systematically. Describes and discusses general characteristics, life history, development, morphology, and anatomy, host range and parasitism, control, and mechanisms of infection, for the more important parasites.

4699. WEERARATNA, W. G. **The taxonomy of the Loranthaceae of Ceylon.** *Ceylon For.* (*n.s.*) 4 (4), 1960 (365–75). 3 refs.

[Cf. *F.A.* 22 No. 1993.] With a key and notes on field characters, distribution, and common host plants, of 26 species.

4700. THODAY, D. **Modes of union and interaction between parasite and host in the Loranthaceae. V. Some South African Loranthoideae.** *Proc. Roy. Soc., Lond.* 152*B* (947), 1960 (143–62). 17 refs. O.R.S.

Describes with illustrations the haustorial structure and behaviour of *Loranthus elegans* on *Acacia karroo* and *Carissa arduina*, *L. prunifolius* on *Rhoicissus cuneifolia*, *L. glaucus* on *Lycium* sp. and *L. dregei* on *Zizyphus mucronata*.

4701. SRIVASTAVA, L. M., and ESAU, K. **Relation of dwarf mistletoe (*Arceuthobium*) to the xylem tissue of conifers. I. Anatomy of parasite sinkers and their connection with host xylem.** *Amer. J. Bot.* 48 (2), 1961 (159–67). 30 refs. O.B.D.

A histological study of various forms of *A. campylopodum* and *A. americanum* infesting 7 conifer species, describing the tissues of the sinkers and the mode of their invasion of the host tissues. In all species, tracheary cells of the sinkers had direct contacts with the host tracheids of both axial and radial systems.

4702. KUMMEROW, J., and MATTE, V. Anatomische Beobachtungen an *Phrygilanthus tetrandrus* (Ruiz et Pav.) Eichl., einer semiparasitischen Loranthacee. **[Anatomical studies on *P. tetrandrus*, a semi-parasitic member of the Loranthaceae.]** *Phytopath. Z.* 39 (4), 1960 (321–6). 7 refs. [G.g. span.] O.R.S.

Describes, and illustrates with photomicrographs, anatomical aspects of the attack by *P. tetrandrus* on *Populus nigra* var. *italica*.

4703. BALLE, S. Contribution a l'étude des *Viscum* de Madagascar. **[A study of the genus *Viscum* in Madagascar.]** *Lejeunia, Liége* 1960. pp. 151 + 31 plates, 3 sets of drawings, 2 tbls., and 14 maps. 33 refs. [F.] P.R.

Deals with the morphology and geographical distribution of 35 species of *Viscum* (listed alphabetically, with key) in Madagascar.

443. Fungi and Bacteria

See also Nos. 4046, 5287.

4704. VASUDEVA, R. S. **Common names of Indian plant diseases.** Indian Council of Agricultural Research, New Delhi. 1959. pp. 50.

Lists the principal pathogens for 279 hosts (including many tree species), giving Latin names and common English names (e.g. leaf spot, black rust, dry rot etc.).

4705. GILMOUR, J. W. **The importance of climatic factors in forest mycology.** *N.Z. J. For.* 8 (2), 1960 (250–60). 25 refs.

In New Zealand some of the most important diseases of trees are due primarily to adverse climatic conditions. Injuries caused by frost, hail, drought, and [water-] saturated soil are dealt with in this paper as predisposing causes of attack by various fungi, while warm humid atmospheric conditions are shown to be necessary for the development of several of the fungi causing leaf-cast or stem-canker diseases. [Cf. *F.A.* 22 No. 4731.] *From author's summary.*

4706. LENGYEL, G. Összefüggések a feketefenyö állományok megbetegedése és az idöjárási viszonyok között. **[The relation between diseases in Austrian Pine stands and weather conditions.]** *Erdö* 10 (1), 1961 (32–6 + smries. in suppl.). [Hu.g.russ.]

The widespread drought mortality in Austrian Pine stands in many parts of Hungary in 1960 was associated with secondary fungal attack on the dying trees, in which were found, e.g., *Brunchorstia destruens*, *Cenangium ferruginosum*, *Dothichiza ferruginosa*, and *Rhabdospora pinea*. To establish the precise cause is difficult but there is a clear correlation between a drought in the preceding autumn and the occurrence of fungal disease, e.g. in 1948. When the rainfall of the preceding autumn has exceeded 25 mm., there is only a sporadic occurrence of fungal disease.

4707. ACATAY, A. Türkiyenin zararlı orman mantarlarına ilâve. **[Fungus diseases in Turkish forests.]** *Istanbul Üniv. Orm. Fak. Derg.* 10*A* (2), 1960 (27–36). 9 refs. [Turk.g.*g*.]

Short notes on habitat of, and damage caused by, *Taphrina alni-incanae*, *Herpotrichia nigra*, *Lophodermium nervisequium*, *Rhytisma acerinum* f. *campestris*, *Pucciniastrum caryophyllacearum*, and *Stigmina platani*.

4708. GARŠINA, T. D. Bolezni greckogo oreha na Černomorskom poberež'e Kavkaza. **[Diseases of *Juglans regia* on the Black Sea coast of the**

Caucasus.] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (134–6). [Russ.]

Briefly discusses seedling wilt (pathogen—*Verticillium albo-atrum*; control—soil sterilization), black spot on leaves (*Marssonina juglandis*, *Gnomonia leptostyla*; control—various sprays), branch dieback (mainly *Melanconium juglandinum*), and stem rot (*Fomes fomentarius*, *Ganoderma applanatum*).

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 4390–4, 4398, 4708.

4709. SNOW, G. A., and ALLEN, R. M. **Damage to Pine seedlings by Santomerse SX.** *Tree Plant. Notes* No. 45, 1961 (25–6).

Severe stunting and needle distortion of Slash, Loblolly, and Shortleaf Pine seedlings were observed in experimental plots regularly and somewhat heavily sprayed with ferbam and Santomerse SX (a surfactant manufactured by Monsanto Chemical Co.). Further experiment showed that it was the surfactant that caused the disorder, and nurserymen are warned to use no more of it than is necessary to ensure good spray coverage.

4710. GIBSON, I. A. S. **Phytotoxic effects of copper fungicides on acid soils.** *E. Afr. agric. J.* 24 (2), 1958 (125–7). 3 refs.

Some limited experiments have indicated that toxic reactions of Pine seedlings to Cu_2O fungicides, when growing in acid soils, may be due to Cu liberated in the soil solution. Cu_2O fungicides ('Perenox', 'Cuprocide') tend to be deposited near the surface of the acid soil, and toxic Cu may accumulate in the region of the germinating seed. There is some evidence that old stocks of these fungicides are more likely to give toxic effects than fresher supplies. Similar toxic effects might conceivably arise from the interaction between acid soils and other metallic fungicides. *From author's summary.*

4711. BASSETT, C. **Phytotoxicity of copper oxychloride on acid soils.** *N.Z. J. For.* 8 (2), 1960 (248–9). 2 refs.

The results of pot experiments with *Pinus radiata* suggest that nurseries with a soil pH of $\leqslant 5{\cdot}0$ should not use Cu oxychloride as a fungicidal soil drench. Below pH 5·0 the fungicide caused an increasing amount of seedling injury as acidity increased, with losses of ca. 75% at pH 4·3. Low pH alone produced no ill effects.

4712. SNOW, G. A. **Artificial inoculation of Longleaf Pine with *Scirrhia acicola*** *Phytopathology* 51 (3), 1961 (186–8). 6 refs.

Describes experiments in which 2-year-old seedlings of Longleaf and Loblolly Pines were inoculated with cultures isolated from infected Pines of both species at various times from December to August. Infection occurred only on immature needles, 3–6 in. long, of Longleaf Pine, and not at all on Loblolly. The incubation period varied from 8 to 11 weeks. The cultures differed greatly in appearance, but there was no correlation between culture characters and infection %, symptoms, or incubation period, except that those from Longleaf were generally more infective.

4713. VAARTAJA, O., CRAM, W. H., and MORGAN, G. A. **Damping-off etiology especially in forest nurseries.** *Phytopathology* 51 (1), 1961 (35–42). 45 refs.

After a series of tests in aseptic test-tubes on *Pinus banksiana*, *P. sylvestris*, and *Caragana arborescens* seedlings [cf. *F.A.* 18 No. 367], strains of *Rhizoctonia solani*, *Pythium debaryanum* and *Phytophthora cactorum* which had proved highly pathogenic, along with *Thielaviopsis basicola*, a fungus of moderate potential pathogenicity, not normally associated with damping off, as a control, were selected for tests on Scots Pine and Caragana in various soils under various moisture and temperature conditions. When a light inoculum (culture suspension) was used, differences in survival as between fungi were small and masked by the pathogenic effect of the natural soil floras, including those of virgin or sterilized (but re-invaded) soils. Mortality, caused mainly by naturally occurring *Pythium* spp., was increased by high soil moisture. With heavy inocula (infected seed/soil mixture), high mortality was caused by all four pathogens, the mean survival %s being lowest for *R. solani*, and, unexpectedly, higher for *P. debaryanum* than for *T. basicola*. They were lowest in unsterile soil and highest in a sterilized soil treated with fungicides. Effects of temperature and moisture were varied and less marked than with light inocula. Except for *R. solani*, mortality was less than in test-tubes, a fact attributed to antagonistic soil flora. (Interaction tests of fungal and bacterial cultures *in vitro* showed many antagonistic effects.) *Fusarium* spp. were often isolated from healthy seedlings. The complex features of the problem are discussed. Only the potential pathogenicity of isolates is considered testable under aseptic conditions; their actual importance should be studied by epidemiological and ecological methods; heavy inoculations may be useful when testing fungicides.

4714. VOROB'EVA, JU. V., and ŽURAVLEVA, M. V. Vlijanie poraženija sejancev sosny gribami iz rodov *Rhizoctonia* i *Fusarium* na vodnyj tok. **[Effect of infection by *Rhizoctonia* and *Fusarium* on the water flow in Scots Pine seedlings.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (137–40). [Russ.]

The water flow in young seedlings, both healthy and diseased, was examined with the aid of P^{32}. Results indicated that, in the acute form of the disease, some kind of constriction occurs in the stem, significantly reducing the upward flow of water and causing death; in the chronic form of the disease, where root rot occurs, there is scarcely any reduction in the flow of water, and some of the seedlings recover.

4715. RADOVANOVIĆ, Ž., and STECHER, H. Dezinfekcija od fuzariuma zaraženih jednogodišnjih sadnica crnog i bijelog bora u rasadniku. **[Disinfection of one-year-old *Pinus nigra* and *P. sylvestris* seedlings from *Fusarium* in the nursery.]**

Nar. Šumar, Sarajevo 14 (7/8), 1960 (372–80). 4 refs. [Serb.g.]

Infected seedlings at the Popova Luka forest nursery, near Zavidovići, Bosnia, were disinfected by being dipped for 1 or 2 min. in solutions of 0·25–2 decilitres formalin in 10 litres water. They were then planted and examined every 10 days during the growing season. Fewest plants of both species died with the lowest concentration used; this saved sufficient seedlings to be economic. The highest concentrations were little better than no treatment in reducing mortality, besides reducing growth of the survivors in the following year.

4716. **[*Crumenula* (*Scleroderris*) *abietina* in Norrland nurseries.]** *Extr.* from *Domänverket, Kungl. Domänstyrelsen, Stockholm 1959*, 1960 (39–40). [Sw.]

Of various preparations tried, maneb gave good control provided that the stems were thoroughly wetted. When only the needles were wetted, it was ineffective. [Cf. *F.A.* 21 No. 3348.]

4717. Šafranskaja, V. N. Rezul'taty ispytanij novyh složnoorganičeskih preparatov protiv boleznej hvoi listvennicy. **[Results of tests with new complex organic preparations against needle-cast of Larch.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (141–53). 6 refs. [Russ.russ.]

Gives the results of laboratory and field trials with phygon ($C_{10}H_4O_2Cl_2$) and zineb against *Meria laricis*, which causes yellowing and needle-cast of *Larix sibirica* in nurseries. Zineb, as a foliar and ground spray at concentrations of 0·2–0·7%, and phygon, as a foliar spray at 0·3–0·4%, were not toxic to the plants. Best results in terms of disease control, yield of standard seedlings, and seedling survival over winter, were from 0·5–0·6% zineb sprayed on to seedlings and soil, and 0·3–0·4% phygon sprayed on to the seedlings. The optimum number of sprays varied.

4718. Magnani, G. Una moria di piantive di eucalitto da *Pestalozzia*. **[Dieback of Eucalypt seedlings caused by *Pestalozzia*]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (27–37 + 1 plate). 7 refs. [It.it.e.]

Describes a dieback of *Eucalyptus preissiana* grown in pots in a greenhouse, which was found to be caused by a fungus very similar to *Pestalozzia versicolor*. Inoculation experiments indicated that the pathogen could successfully attack only debilitated seedlings.

443.3. Diseases of Older Stages

4719. Krangauz, R. A. Usyhanie klena ostrolistnogo ot boleznej i mery ih preduprеždenija. **[Disease mortality in *Acer platanoides*, and ways of preventing it.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (108–33). 7 refs. [Russ.russ.]

The two chief causes of the mass mortality of *A. platanoides* observed in steppe plantations in S.E. European Russia, especially in mature and maturing Oak/Maple stands, are *Massaria inquinans* and *Verticillium dahliae*; other pathogens are *Microdiplodia* sp. and *Nectria cinnabarina*. All four species are described and illustrated. Inoculation tests with *M. inquinans* and *Microdiplodia* sp. have been successful. The only control measures so far possible are prophylactic, e.g. sanitation fellings, stump protection with creosote/coal-tar mixtures, replacing *A. platanoides* with other species, etc.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 4708, 5200.

4720. Kimmey, J. W., and Bynum, H. H., Jr. **Heart rots of Red and White Firs**. *For. Pest Leafl. U.S. For. Serv.* No. 52, 1961. pp. 4. 4 refs.

Notes on rot fungi causing heart rots in *Abies magnifica* and *A. concolor* in California.

4721. Bakshi, B. K., and Singh, B. **Heart-rot and decay due to *Polyporus palustris*** *Indian For.* 87 (2), 1961 (116–8 + 7 photos, 1 set of dgms.). 3 refs.

P. palustris, once known only from conifers, has been found commonly on both conifers and hardwoods. It causes decay of creosoted *Shorea robusta* and *Pinus roxburghii*, and also heart rot of living *Cassia nodosa*. Its sporophores are recorded for the first time from India, and are described with details of culture studies.

4722. Bertus, A. L. **Fungi causing root disease of forest trees in Ceylon**. *Ceylon For.* (*n.s.*) 4 (4), 1960 (376–8). 2 refs.

Lists fungi found on 33 forest tree species.

4723. Wallis, G. W. **Infection of Scots Pine roots by *Fomes annosus***. *Canad. J. Bot.* 39 (1), 1961 (109–21). 7 refs. O.R.S.

Describes a method for *in situ* inoculation of Scots Pine roots with *F. annosus*. In laboratory and field trials, spores of *F. annosus* caused infection of Scots Pine roots only when sown on woody tissues exposed by cutting. A method is described whereby it is possible to observe spore development on the root surface. The influence of microbiological and nutritional factors on infection of roots by *F. annosus* spores is discussed. *From author's summary.*

4724. Miller, O. K., Jr. **The distribution of *Fomes annosus* (Fries) Karst in New Hampshire Red Pine plantations and some observations on its biology**. *Bull. Fox For.* No. 12, 1960. pp. 25. 24 refs.

Detailed results of a survey already noticed [see *F.A.* 21 No. 3356]. The disease was generally distributed in older plantations in southern New Hampshire, occurring in 68% of thinned stands examined vs. 6·5% of unthinned stands. Studies at two infection centres are reported. Biological observations included: laboratory growth of a *F. annosus* sporophore from its inception to formation of the first mature basidia took 37 days; temperature at 2 cm. depth in the duff, where most sporophores are found, was lower and less variable than at 1 cm. above the duff; advance vegetative growth of *F. annosus* was found 5 ft. from the ground on a Red Pine which still had green needles, though there were fewer needle fascicles, and the needles were a paler colour.

4725. WARD, E. W. B., and HENRY, A. W. **Comparative response of two saprophytic and two plant parasitic soil fungi to temperature, hydrogen-ion concentration, and nutritional factors.** *Canad. J. Bot.* 39 (1), 1961 (65–79). 33 refs. O.R.S.

The behaviour of two soil saprophytes, (*a*) *Trichoderma viride* and (*b*) *Trichocladium asperum*, and two root-infecting fungi, (*c*) *Ophiobolus graminis* and (*d*) *Fomes annosus*, was compared under various conditions *in vitro*. On an agar-solidified organic medium, optimum temperatures for growth were approximately: (*a*) 25–30°, (*b*) 20–25°, (*c*) 20–25° and (*d*) 25° C. In the optimum range, (*a*) rapidly outgrew the other fungi, but at lower temperatures, its growth rate was equalled by that of (*c*) at 10°; (*a*) was the only fungus to grow at 35°. In a synthetic liquid medium adjusted to pH values of 3·0–7·0 with a citrate-phosphate buffer, growth of (*c*) and (*d*) was sharply reduced at pH values $<5{\cdot}0$. Reduction in growth of (*b*) occurred only below pH 4·0, and (*a*) made good growth at pH 3·1. Both (*c*) and (*d*) required thiamine for growth in a synthetic medium and (*c*) also required biotin; in addition, both showed a preference for organic as opposed to inorganic N sources. Neither (*a*) nor (*b*) required vitamins, and both grew well with KNO_3 as the N source. All four fungi readily utilized *d*-glucose, *d*-fructose, and *d*-mannose, but *d*-arabinose was poorly utilized. Utilization of other hexoses, pentoses, disaccharides, and polysaccharides varied considerably between the fungi. The relationship of the results obtained to the observations of others on the ecology of soil fungi is discussed, and the possibility that combinations of physical and nutritional factors may favour specific fungi in the soil is considered. [Cf. *F.A.* 20 No. 4275.] *From authors' summary.*

4726. GUNDERSEN, K. **Growth of *Fomes annosus* under reduced oxygen pressure and the effect of carbon dioxide.** *Nature, Lond.* 190 (4776), 1961 (649). 2 refs.

Seasonal variation in O and CO_2 pressures in stems of several hardwood and softwood species was investigated by Chase in 1934, when it was found that in summer the O content in the wood of *Pinus strobus* would drop to ca. 1%, corresponding to a pressure of 8 mm. Hg, while at the same time the CO_2 content increased to ca. 10%. Experiments recently made with *Fomes annosus* (9 different strains isolated from infected *Pinus sylvestris* and *Picea abies*) showed that it is able to grow equally well under aerobic and micro-aerophilic (ca. 0·2 mm. O) conditions, but not anaerobically. A slight elevation of the CO_2 pressure (ca. 23 mm.) had a stimulating effect on growth, but a high CO_2 pressure (760 mm.) inhibited mycelial growth.

4727. NEGRUCKIJ, S. F. Ob intensivnosti sanitarnyh rubok provodimyh v celjah bor'by s kornevoj gubkoj. **[The intensity of sanitation fellings to control *Fomes annosus*.]** *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (162–4). [Russ.]

Studies were made in pure, 25-year-old Scots Pine plantations in the Voronezh region, suffering in various degrees from *F. annosus* attack. All dead standing trees, obviously injured trees, and apparently uninjured trees round foci of infection, were felled. The fellings removed 12·5–34·2% of the standing volume. Mortality in the following five years is tabulated. In stands of density ca. 0·8, not badly attacked, sanitation fellings should remove 10–15% of standing volume; in stands of density 0·86–0·87, already gappy as a result of attack, some 25–30% can be removed. In dense stands that are seriously attacked, standing volume should be reduced by 20–30%.

4728. DOMAŃSKI, S. Grzyb *Leptoporus albidus* (Schaef. ex Seer.) Bourd. et Galz. i jego rozpoznanie. **[*Polyporus albidus* and its identification.]** *Acta Soc. Bot. Polon.* 29 (4), 1960 (655–71 + 1 tbl.). 21 refs. [Pol.f.] O.B.D.

Describes its characteristics both in the field and in culture. It is fairly abundant in the conifer forests of Poland, causing a brown rot in stumps, and also in living stems and roots, particularly of *Picea abies*.

4729. MURRAY, J. S., and YOUNG, C. W. T. **Group dying of conifers.** *For. Rec. For. Comm., Lond.* No. 46, 1961. pp. 46 + 7 photos, 2 dgms., 3 sketchmaps. 17 refs.

Describes investigations of the root disease of conifers caused by *Rhizina undulata* on the sites of fires lit during forestry operations in pole-sized crops. [Cf. *F.A.* 20 No. 733; 22 Nos. 712, 2002.]

4730. GREMMEN, J. Naaldhout afsterving door *Rhizina undulata*, in het bijzonder na takkenbranden op kaalslagen. **[Dieback of conifers caused by *R. undulata*, particularly after slash burning on clear-felled sites.]** *Ned. Bosb. Tijdschr.* 33 (1), 1961 (5–10). 7 refs. [Du.e.] (*Korte Meded. Bosbouwproefsta., Wageningen* No. 45.)

An example is described of group dying of older trees in a 55-year stand of *Pinus nigra* var. *austriaca*; since 1957 many new infections have been found, resulting from fires during thinning. In young stands, slash burning by the three methods commonly used in the Netherlands (burning a few large piles, or many smaller piles scattered over the area, or burning on a metal plate) heats the humus to an extent that stimulates attack by *R. undulata*, sometimes to the point where all young plants are infected. Attack is mainly on Pine species, but sometimes also on Douglas Fir. Piling the slash in rows is recommended, as preferable to burning it; if burning is considered necessary, the land should be left for several years before planting.

4731. NEWHOOK, F. J. **Some comments on the relationship of climate to *Phytophthora* infection of *Pinus radiata*.** *N.Z. J. For.* 8 (2), 1960 (261–5). 16 refs.

[Cf. *F.A.* 21 No. 637; 22 No. 4705.] A disease of *Pinus radiata* in New Zealand in which trees die or become severely defoliated following infection with *Phytophthora* spp. in wet seasons is compared with similar diseases of other hosts overseas. It is concluded that, as with these other diseases, soil saturation provides the conditions necessary for production and spread of free-swimming spores of the pathogen. It has been stated recently that climatic conditions are the "major cause" of this disease, the fungi being "secondary". Present findings emphasize that host, pathogen, and environment are mutually interdependent; no one factor can rightly be singled out as "more important" than another. *Phytophthora* spp. appear to be indigenous in New Zealand soils and it is not surprising to find them in many forest areas, where they must be regarded as one of the factors limiting production. *From author's summary.*

4732. **Saprophytic survival of *Phytophthora palmivora*.** *Extr.* from *Annual Report of the West African Cocoa Research Institute 1959/60*, 1961 (30).

Regular sampling of soil at 7 different sites in Ghana has confirmed previous observations that the soil acts as a source of infection throughout the year, although isolation was less frequent during the earlier, hotter months of the year when there was less rainfall. Monthly samplings of foliage and bark of Cacao trees have resulted in only occasional isolation of the fungus, but detritus collected in crevices, branch junctions etc., frequently contained it. In laboratory tests, sporangia of *P. palmivora* in soil samples have been found to remain viable for at least one year. Viability is affected by the moisture content of the soil, and some variation was found in different soil types tested.

Wilts, Diebacks etc.

See also Nos. 4708, 4789, 4812.

4733. KUNTZ, J. E., and DRAKE, C. R. **Control of the local spread of Oak wilt with soil fumigants.** *For. Res. Note Wis. Coll. Agric.* No. 68, 1960. pp. 6. 14 refs.

In tests to control transmission of the Oak wilt fungus (*Ceratocystis fagacearum*) through root grafts, soil injections of MeBr and/or SMDC at various rates of application successfully killed portions of roots of *Quercus ellipsoidalis* (4–10 in. d.b.h.) in central Wisconsin. Xylem vessels remained open in both the living (creamy white) and rapidly killed (brown) portions of the roots, but were plugged tightly with tyloses in the narrow transition zones between the living and dead tissue. Sections of roots with plugged vessels greatly reduced or prevented the passage of water. Neither poisons nor the fungus passed through killed roots across fumigation zones; in most cases, such zones have prevented further local spread of the fungus from centres of natural infection.

4734. NAIR, V. M. G., and KUNTZ, J. E. **Histological studies of Bur Oaks inoculated with the Oak wilt fungus, *Ceratocystis fagacearum* (Bretz) Hunt.** *For. Res. Note Wis. Coll. Agric.* No. 66, 1960. pp. 5. 15 refs.

Tests in central Wisconsin confirmed earlier reports [cf. *F.A.* 16 No. 1918] that *C. fagacearum* distribution and disease development in inoculated *Quercus macrocarpa* were confined to vertical sectors of the stem and to vascularly connected branches. Few hyphae were observed in the xylem vessels before or during incipient wilt. The progress of the disease was studied microscopically and is described.

4735. WILSON, C. L. **Study of the growth of *Ceratocystis fagacearum* in Oak wood with the use of autoradiograms.** *Phytopathology* 51 (4), 1961 (210–5). 14 refs.

A study of the fungus, supported by microphotographs, based on sections from (*a*) the bole and branches of naturally infected, already semi-defoliated *Quercus marilandica* and Red Oaks, (*b*) the bole of a *Q. marilandica* infected with an inoculum labelled with S^{35}, and (*c*), sapwood blocks of that species similarly inoculated. In general, fungal growth in (*a*) was sparse in the vessels and tracheids, but vessels and tracheids filled with conidia and hyphae did occur, and spore-like bodies could be seen in some of their walls. In (*b*) and (*c*), where it was possible to follow growth in parenchyma (impossible by staining techniques), most of the fungal growth occurred in parenchyma cells of the medullary rays, uniseriate rays, and xylem parenchyma, and there was extensive invasion of the middle lamellae. Of vessels, tracheids, libriform fibres and tracheid fibres, vessels contained most fungal growth. Penetration of walls was generally through pits, but sometimes also direct. Appressoria were sometimes formed before penetration. The diameter of the hyphae varied from 0·5 to 4·0 μ. Dense areas of radiation outside the mycelium indicated that S-containing enzymatic diffusates were active on starch grains and the middle lamellae. S^{35} inhibited growth and sporulation and caused mutations when added to the culture medium at 1·25, but not at 0·25, millicuries/50 ml.

4736. PARTRIDGE, A. D. **Fumigants kill the Oak wilt fungus in wood.** *For. Prod. J.* 11 (1), 1961 (12–4). 10 refs.

In order to find an efficient non-destructive method of disinfection, 15 chemicals were tested in gaseous solution at a concentration of 1 ml. liquid to 250 litres air space. With 3 days' exposure, only chloropicrin and MeBr killed all fungus in artificially infected 8-in. stem sections of *Quercus velutina* and *Q. alba*, 3–4 in. in diam., with fungal penetrations of ¾–1½ in. in sapwood and up to ¾ in. in heartwood. With 7 days' exposure, propylene oxide was also effective.

4737. ANDERSON, M. L. **Elm disease.** *Nature, Lond.* 189 (4768), 1961 (886–7).

A review of *T. R. Peace* "The status and development of Elm disease in Britain" [see *F.A.* 22 No. 2034], stressing the importance of allowing for locality differences in studies of this kind, when dealing with an exacting genus such as *Ulmus*.

Cankers, Stem Rusts etc.

4738. BIER, J. E. **The relation of bark moisture to the development of canker diseases caused by native, facultative parasites. IV. Pathogenicity studies of *Cryptodiaporthe salicella* (Fr.) Petrak,**

and *Fusarium lateritium* Nees., on *Populus trichocarpa* Torrey and Gray, *P.* '*robusta*', *P. tremuloides*, and *Salix* sp. *Repr.* from *Canad. J. Bot.* 39 (1), 1961 (139–44). 5 refs.

[Cf. *F.A.* 21 Nos. 2010–2.] In the field, *C. salicella* has been found only on *Salix* sp., and *F. lateritium* only on nursery-grown *P. trichocarpa*. However, the pathogens both attacked *P. trichocarpa*, *P.* × *robusta*, *P. tremuloides*, and *Salix* sp. when inoculations were made on cuttings which were allowed to dry gradually in a dormant condition. The development of the diseases in the field and in the laboratory was related to the moisture content of the host bark. Canker growth occurred only when the relative turgidity of the bark was <80%. The possibility of employing similar methods of investigation for the discovery and evaluation of canker diseases of importance in disease-testing programmes is discussed. *From author's summary.*

4739. BIER, J. E. **The relation of bark moisture to the development of canker diseases caused by native, facultative parasites. V. Rooting behaviour and disease vulnerability in cuttings of *Populus trichocarpa* Torrey and Gray, and *P.* '*robusta*'.** *Repr.* from *Canad. J. Bot.* 39 (1), 1961 (145–54). 7 refs.

[Cf. preceding abstract.] In cuttings from 1-year shoots of *P. trichocarpa* and *P.* × *robusta*, a correlation was found between degree of vigour (expressed by the production of basal callus and the associated wound roots), and the relative turgidity of the living bark. The ability to produce basal callus and wound roots decreased in cuttings with relative turgidities of <80%, and many were killed by basal cankers caused by *Fusarium lateritium* and *Cytospora chrysosperma*. Thus bark m.c. was indicative both of this ability and of vulnerability to the canker diseases. In uniform-sized cuttings of *P.* × *robusta*, no relation was found between the production of morphological roots developing from root primordia, and bark m.c. or % survival of plants. Larger numbers of morphological roots developed on cuttings from the basal, and therefore older, parts of the stem. The production of basal callus and wound roots in *P.* × *robusta* was related to the total weight of cuttings of uniform size. This suggested that weight determinations in the field may provide useful guides to the general vigour of dormant nursery stock and stored material. *From author's summary.*

4740. LEONTOVYČ, R. Príspevok k poznaniu *Dothichiza populea* Sacc. et Briard na Slovensku. I. Rozšírenie a vývojové cykly so symptomatikou. **[*D. populea* in Slovakia. I. Distribution, development cycles and symptoms.]** *Ved. Práce Výskum. Úst. Lesn. Hosp., Bansk. Štiav.* No. 1, 1960 (233–56). 11 refs. [Slovak.slovak.russ.g.]

D. populea occurs almost everywhere in Slovakia where American or Euramerican Poplars are grown. Three periods of infection, all dependent on the occurrence of rain, are distinguished, viz. spring (infection by conidia and ascospores), summer (conidia), and autumn (conidia and ascospores).

4741. BACHTHALER, G., and DAHTE, A. Ergebnisse eines Mittelprüfungsversuches zur Bekämpfung von *Dothichiza populea*, dem Erreger des Pappelrindentodes. **[A test of preparations for the control of *D. populea*.]** *Pflanzenschutz, München* 11 (10), 1959 (135–8). 1 ref. [G.g.] I.M.I.

Describes tests with (*a*) Brestan (Zn acetate) 0·3%, (*b*) Cu hydroxide 0·75%, (*c*) 'Cu oxydul ultra' 0·3%, and (*d*) Quecksilber Bayer (on Hg basis) 0·1%, on 1 + 2 *Populus* × *robusta*, sprayed 1 to 4 times from mid-July to mid-September (tests with 2 + 2 plants could not be evaluated). In the following spring, 95·6% of the plants treated 4 times with (*a*) were uninfected, and only 2·2% heavily infected, vs. 8% uninfected and 84·6% heavily infected on the control plot. Four sprayings of (*b*) or (*c*) protected ca. 80%; (*d*) was ineffective. (*a*), (*b*) and (*c*), but not (*d*) gave good control of *Melampsora larici*. Plants sprayed 3 or 4 times kept their foliage longer than normal.

4742. PROCENKO, A. E. Grib *Endothia fluens* (Sow.) Shear et Stev., poražajuščij *Castanea sativa* Mill. na Kavkaze. **[*E. fluens* damaging *C. sativa* in the Caucasus.]** *Bot. Ž.* 45 (6), 1960 (832–43). 9 refs. [Russ.russ.e.]

A special study involving both morphological and cultural characteristics, as well as inoculations, established that the fungus infecting *C. sativa* in the Caucasus is not *E. parasitica* but *E. fluens*. The distribution of *E. fluens* in the Caucasus coincides with that of *C. sativa*, but the fungus is never a primary cause of the tree's death.

4743. KRSTIĆ, M., and HOČEVAR, S. Uticaj nekih antagonističkih mikroorganizama na infekcije pitomog kestena od *Endothia parasitica* Anders. **[The influence of some antagonistic microorganisms on the infection of *Castanea sativa* by *E. parasitica*.]** *Zašt. Bilja* No. 54, 1959 (41–52). 4 refs. [Serb.e.e.] I.M.I.

Field experiments were carried out with *Penicillium rubrum*, *P. lilacinum*, *Verticillium* sp., and *Bacillus subtilis*, on the basis of laboratory culture tests of their antagonism to *E. parasitica* [cf. *F.A.* 16 No. 655]. Incisions in the bark of healthy Chestnut shoots were inoculated (*a*) with an antagonist and the pathogen simultaneously, or (*b*) with an antagonist alone, then exposing to natural infection. An antagonistic effect was obscured in (*a*) by the faster growth of *E. parasitica*, but was clearly seen in (*b*); only 5 out of 704 (*b*) incisions in 4 trials became infected vs. 25 for the same number of control incisions without either (*a*) or (*b*) inoculation. *P. rubrum*, which had shown marked antagonism in culture, was the most effective. The small number of natural infections led to the supposition that an antagonistic flora might already exist in the stand. The artificial introduction of antagonistic organisms into Chestnut stands, where possible, is suggested, particularly in stands still free of *E. parasitica*.

4744. IERUSALIMOV, E. N. Želtaja puzyrčataja ržavčina—hroničeskoe zabolevanie sosnjakov Amurskoj oblasti. **[*Cronartium quercus*—a chronic disease of Scots Pine forests of the Amur region.]**

Lesn. Ž., Arhangel'sk 3 (3), 1960 (161–2). 1 ref. [Russ.]

C. quercus occurs where the areas of *Pinus sylvestris* and *Quercus mongolica* overlap, i.e. in the central reaches of the Amur. The disease and its pathogen are briefly described. Disease incidence at first increases sharply with diameter class, but some forms of Pine, even the biggest trees, are apparently immune. The degree of crown attack does not depend on stem diameter, and first-order branches are worse attacked than second- or third-order ones. Control would be possible by keeping the Pine and Oak separate, and also by removing Oak from the stands in the W. of the Amur region as an unpromising species.

4745. GARIN, G. I. **Southern fusiform rust on Slash Pine planted in the Alabama piedmont**. *Journal of the Alabama Academy of Science, Birmingham, Ala.* 31 (4), 1960 (265–70). 4 refs. L.S.

Describes mortality and rust infection in a Slash Pine plantation 7, 11, and 16 years after planting. Though incidence of rust was high (ca. 57% of trees showing symptoms at 11 and 16 years from planting), there were 375 apparently healthy trees per acre at the later date, of which 295 remained after a first pulpwood thinning. Of the 225 infected trees per acre remaining, many had cankers only on branches or on the base of the stem. It is thought that, with judicious thinning, few trees with multiple stem cankers will remain when the trees reach sawlog size, and that the effect on yield will be small. Early pruning of infected branches would have reduced it further.

4746. PETERSON, R. S. **Western gall rust cankers in Lodgepole Pine**. *J. For.* 59 (3), 1961 (194–6). 12 refs.

[Cf. *F.A.* 21 No. 3323; 22 No. 3286.] Covers nomenclature, hosts and range, development on *Pinus contorta*, damage, and control (restricted so far to removing cankered stems in thinning and intermediate cuts, and pruning branch galls).

4747. AHLGREN, C. E. **Progress with direct bark inoculation for White Pine blister rust**. *J. For.* 59 (3), 1961 (208–9). 2 refs.

Describes tests in which entire rings of bark containing active *Cronartium ribicola* mycelium were transferred from cankered to healthy 6- to 9-year *Pinus strobus* stems. Out of 25 such inoculations, 14 transmitted the disease; 7 trees died through graft failure where bands were taken from the oldest portion of a canker; and in 4 cases the disease did not spread and symptoms disappeared from the grafted band. As infection was evident on all successful inoculations within a year after grafting, the method shows considerable superiority over other methods in time required to determine resistance.

4748. POMERLEAU, R. **On the effects of White Pine blister rust in a plantation**. *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (1).

Gives data from a survey made in 1958, 1959, and 1960, of a plantation of *Pinus strobus* in Quebec, established in 1943. When the stand was first examined in 1958 ca. 40% of trees were apparently sound; this proportion was reduced to 25% in 1959 and 20% in 1960. It is expected that most of the White Pine will die within the next 8–10 years. These facts illustrate the hazard of planting this species without careful site selection and eradication of *Ribes*.

4749. KING, D. B., STOLTENBERG, C. H., and MARTY, R. J. **The economics of White Pine blister rust control in the Lake States**. Forest Service, U.S. Department of Agriculture, Washington, D.C. 1960. pp. 40 + 28 + 17. 18 refs.

Summarizes the results of an analysis of the economic aspects of protecting *Pinus strobus* in the Lake States region from attack by *Cronartium ribicola*, and describes an improved method for estimating the monetary benefits that can be expected to result from blister-rust control in individual stands.

Foliage Diseases

See also Nos. 4152, 4707–8.

4750. RAYNER, R. W. **Measurement of fungicidal effects in field trials**. *Nature, Lond.* 190 (4473), 1961 (328–30). 3 refs.

During field trials on the control of Coffee rust (*Hemileia vastatrix*) in Kenya, special methods were devised to obtain maximum sensitivity by minimizing the effects of localized natural variability in intensity of attack. These methods are of general application, and may be adapted for use in the study of other tree diseases. It was shown that the intensity of rust attack may be estimated from the % of rusted leaves per bush, since there is evidence that this is mathematically related to the number of rust mycelia per leaf.

4751. MEIDEN, H. A. VAN DER. Methoden ter beoordeling van de aantasting van populier door roest. **[Method for rating rust infection on Poplars.]** *Ned. Bosb. Tijdschr.* 33 (3), 1961 (77–80). 3 refs. [Du.e.]

Schreiner's rating for *Melampsora* infection [see *F.A.* 21 No. 2020] is modified by the addition of a further class of infection, heavy necrosis and leaf-fall, with numerical values 125–375.

4752. MEIDEN, H. A. VAN DER, and KOLSTER, H. W. De gevoeligheid van een aantal populiereklonen voor roest (*Melampsora larici-populina*). **[The susceptibility of a number of Poplar clones to infection by *M. larici-populina*.]** *Ned. Bosb. Tijdschr.* 33 (3), 1961 (81–4). 2 refs. [Du.e.]

Tabulated data are given for tests in 1959–60 of susceptibility and height growth of some 25 commercial clones and new selections. *P.* 'Robusta' Best 03 was used as the standard clone. A few of the commercial clones, notably I 214, are less susceptible than or equal to the standard. The new selections gave very good results, numbers 923, 925 and 1070 being completely resistant. Height growth during the first 2 years was very rapid in 925 and 1070. That of I 214 was best among the commercial clones.

4753. JUNG, J. Die Schütte-Epidemie 1955–58 und ihre Bekampfung. **[Control of the *Lophodermium pinastri* epidemic of 1955–58.]** *Mitt. StForstverw. Bayerns* No. 31, 1960 (71–5). [G.]

In tests in Bavaria, one treatment in late July with zineb 0·3% generally sufficed for plantations >3 years old, fine sprays providing better adhesion with less water than coarse sprays. In preliminary tests, electro-dusting [cf. *F.A.* 19 No. 528] further improved adhesion and distribution, particularly to the underside of needles, required less water and fungicide, and took less time. The attachment to the portable sprayers, consisting essentially of a 6- to 12-volt battery, a fine wire mesh over the nozzle, and an earthing chain, weighed ca. 2 kg.

4754. ŠEVČENKO, S. V. Opadannja hvoji—"Schütte"—nebezpečna hvoroba sosnovyh kul′tur u zahidnyh oblastjah URSR. **[Needle-cast, a dangerous disease of Pine plantations in the western regions of the Ukraine.]** *Ukr. bot. Ž.* 17 (5), 1960 (85–92). 26 refs. [Ukr.russ.e.] A.P.B.

Describes the life cycle of *Lophodermium pinastri*, which causes needle-cast on a large scale in W. Ukraine, on (*a*) *Pinus sylvestris* on level sites and (*b*) *P. mugo* in the Carpathians at 1450 m. alt. The cycle of development of the fungus was annual in (*a*) but biennial in (*b*). Data are given on the effects of the disease on 5-year plantations of (*a*). Diseased plants had a height increment $\frac{1}{2}$–$\frac{1}{3}$ that of healthy ones, and many died. Proposals for control include use of healthy seed and planting stock, careful choice of sites, and spraying with fungicide.

4755. WAKIMOTO, S., IKARI, H., and YOSHII, H. **[Relation between polyphenols contained in plants and phytopathogenic fungi. II. On some polyphenols from the Paulownia-tree and their additive effect on the growth of the pathogenic fungus *Gloeosporium kawakamii*. III. Decomposition of C^{14}-labelled polyphenols from leaves of Paulownia tree by *G. kawakamii*.]** *Annals of the Phytopathological Society of Japan, Tokyo* 24 (4), 1959 (195–206). 74 refs. [Jap.jap.e.*e*.] I.M.I.

Paper-chromatographic analysis of leaves of *Paulownia* showed no difference in total polyphenol content between healthy leaves and leaves attacked by *G. kawakamii*; but the latter contained more *o*-di-hydroxyl types. *In vitro*, chlorogenic acid, rutin, and quercetin, found in the leaves, stimulated growth of the fungus and were decomposed by it into protocatechuic acid, phloroglucinol and other substances. This growth-promoting effect is attributed, at least in part, to the nutrient effect of phloroglucinol. Tests with labelled polyphenol fractions, extracted from leaves of plants that had been kept in an atmosphere containing $C^{14}O_2$, and added to the culture medium, also showed that these fractions were utilized by the pathogen and partly released as CO_2.

444. Virus Diseases

4756. SMITH, K. M. **Plant viruses.** Methuen & Co. Ltd., London. 3rd ed. (rev.) 1960. pp. ix + 209 + 8 plates. Many refs. Price 16*s*. 6*d*.

A concise treatise dealing, in Part I, with the virus in the plants, the diseases caused and their physiology, dissemination, arthropod vectors, and electron microscopy of viruses, and in Part II with virological techniques, including inoculation, testing, serology, purification, and control. [Cf. *F.A.* 18 No. 3044.]

4757. ČECH, M., KRÁLIK, O., and BLATTNÝ, C. **Rod-shaped particles associated with virosis of Spruce.** *Phytopathology* 51 (3), 1961 (183–5). 9 refs.

Rod-shaped particles of hexagonal structure, varying from 200 to 3000 mμ in length, were identified by electron microscopy in the exudates, free from resin, of woody twigs from naturally diseased trees in S. Bohemia, and from seedlings infected through *Sacchiphantes abietis* or by grafting [cf. *F.A.* 18 No. 3045], but not in controls. They were found not only in branches showing pronounced symptoms, but also in others, almost without symptoms, from all parts of the tree. Particles rarely occurred in needle exudates, which were difficult to prepare for examination. The techniques used are described. Simple sap extracts proved unsuitable for this type of study.

4758. MILINKÓ, I., and SCHMELZER, K. Zur Kenntnis der Mosaikkrankheit der Robinia (*Robinia pseudoacacia* L.). **[The mosaic disease of *R. pseudoacacia*.]** *Phytopath. Z.* 41 (1), 1961 (36–41). 5 refs. [G.g.e.] O.R.S.

Describes the symptoms and discusses the extent and distribution of the disease in Hungary and its occurrence elsewhere in central Europe. It is probably caused by a virus. Isolates from infested trees, when applied to herbaceous plants, produced symptoms of two similar but not identical viruses.

45. Damage by Animals

451. Mammals

See also Nos. 4032, 4308, 4476, 5306.

4759. KOSKIMIES, J. Linnut ja nisäkkäät metsien vahinko- ja hyötyeläiminä. **[The role of birds and mammals in the life of forests.]** *Metsät. Aikak.* 1961 (1), (14–9). 15 refs. [Fi.e.]

Discusses the loss of Spruce seed caused by crossbills, squirrels, woodpeckers, passerine birds and small rodents in S. Finland, damage to leaves, twigs, bark, roots etc. by moose, snow hare, beaver and gallinaceous birds, and the beneficial effect of insectivorous birds and mammals. Recommends further research in Finland.

4760. ABBOTT, H. G. **White Pine seed consumption by small mammals.** *J. For.* 59 (3), 1961 (197–201). 8 refs.

Studies in Massachusetts showed that mice and voles are capable of destroying large amounts of *Pinus strobus* seed. When occurring in substantial numbers the animals consume far more seed than can be economically used in direct sowing. They are also able to eat or store all naturally disseminated seed. In laboratory experiments in cages, (*a*) *Peromyscus leucopus* ate a mean of 109 seeds per day, (*b*) *Clethrionomys gapperi* ate 97, and (*c*) *Microtus pennsylvanicus* 139. When *P. strobus* seed was exposed in 4 feeders in a ½-acre plot in an abandoned Juniper pasture, 15 lb. 15 oz. of seed were eaten or removed in a 68-day period from Oct. 3 to Dec. 9. In trapping to determine the species and number of animals responsible, 14 (*a*) and 8 (*b*) were caught. Counts of empty seed-coats showed that half the seeds were eaten in the feeders and half removed, presumably for storage. It was estimated that each (*a*) destroyed 260 seeds a day, vs. 232 for each (*b*).

4761. SCHINDLER, U. Forstlich wichtige Kleinsäuger, Merkmale und Feststellung ihrer Besatzdichte. [**Small mammals of forestry importance: identification and density determinations.**] *Forstsch.-Merkbl. Niedersächs. Forstl. VersAnst.* (*Abt. B*) No. 12, 1961. pp. 19 + 1 plate. 12 refs. [G.]

Describes and illustrates the chief Muridae, Microtinae, Muscardinae and Soricidae of W. Germany, discussing habitats, characteristics of damage to forest species, trapping methods for density determinations and, for *Microtus agrestis*, critical densities.

4762. SCHINDLER, U. Auftreten und Bekämpfung der Rötelmaus (*Clethrionomys glareolus* Schreber) im Dürrejahr 1959 in Nordwestdeutschland. [**The occurrence and control of *C. glareolus* in N.W. Germany in the drought year 1959.**] *Repr.* from *Z. angew. Zool., Berl.* 47 (4), 1960 (431–47). 15 refs. [G.g.e.]

Describes an outbreak following the mild winter and spring of 1958–59. This led to severe damage, particularly in the lower hill regions, from August to October, before the drought (which had caused the voles to feed unusually early and heavily on the bark of Beech, Larch and Douglas Fir on the borders of thickets, their usual habitat, and to invade young plantations and natural regeneration) brought about the collapse of the epidemic [cf. *F.A.* 22 No. 2067]. Area treatments with endrin or toxaphene at the largest dosages considered permissible in view of the danger to other animals were only partly successful, probably because these voles, by feeding mainly on seed, ingest less than *Microtus agrestis* (which feeds mainly on grass). Trials e.g. with poisoned grain in tins bent so as to prevent access by larger mammals or birds, and poisoned sunflower seeds in sealed plastic bags have been promising.

4763. [**Control of pocket gophers by 2,4-D.**] *Extr.* from *72nd Report of the Agricultural Experiment Station, Colorado State University, Fort Collins 1958/59*, 1959 (8).

Experiments have shown that ca. 85–95% of pocket-gopher populations die off within one year of spraying range with 2,4-D, and that there is no increase in numbers 2 years after treatment, which apparently interferes with successful reproduction and survival of young.

4764. BIDER, J. R. **An ecological study of the hare *Lepus americanus*.** *Canad. J. Zool.* 39 (1), 1961 (81–103). 29 refs. O.R.S.

Ranges of hares were studied in an area in Quebec supporting stands of mixed conifers and hardwoods. These are classified in 6 types. The feeding habits of the hares are related to cover type, plant species, and time of year, and damage to commonly used tree and shrub species in the period from late autumn to early spring is discussed and illustrated.

4765. WALTERS, J., and SOOS, J. **The relative efficiency of three hare-repellents in protecting Douglas-Fir seedlings.** *For. Chron.* 37 (1), 1961 (22–8, 19). 14 refs.

The repellents tested were: (*a*) TN 2500 (a proprietary compound), (*b*) nicotine asphalt emulsion, and (*c*) TMTD (thiram), all applied by brushing; (*c*) was the most, and (*b*) the least efficient, but differences were not great; persistence varied in the same order as relative efficiency. The repellents provide complete protection only to that part of the seedling covered, and new growth appearing after the repellent was applied, was attacked with increasing frequency as the repellent became weathered. In view of the expense of re-treatment, this system of protection is considered inadequate, and should be supplemented by other protective measures.

4766. BURNS, R. M. **Rabbit repellents in North Mississippi.** *Tree Plant. Notes* No. 45, 1961 (19–22). 5 refs.

Pinus taeda seedlings in the nursery were pressure-sprayed with 35 formulations, and then lifted and planted out. The 8 formulations meeting the standard set (first-year survival $>80\%$ and rabbit damage $\ngtr 50\%$ of controls) were, in order of effectiveness: endrin/latex, endrin/wax, endrin/asphalt, Zn/wax, Zn/asphalt, Zn/latex, nicotine/latex, and Ca/asphalt. Recommended mixtures are tabulated.

4767. **Repellents reduce browsing of Ponderosa Pine by mule deer (*Odocoileus hemionus*].** *Extr.* from *Rep. Rocky Mt. For. Range Exp. Sta. 1960*, 1961 (26–7).

Treatment of badly browsed small Ponderosa Pine in Arizona with 10% TMTD (thiram) and ZAC (ziram) greatly reduced browsing. In the first year, 56% of untreated twigs were browsed vs. 9 and 8% treated with ZAC and TMTD respectively. The effect did not carry over to the second growing season.

4768. DAVIDSON, M. M., and KEAN, R. I. **Establishment of red-deer range in the Tararua mountains.** *N.Z. J. For.* 8 (2), 1960 (293–324). 40 refs.

The authors trace the history of the Tararua forests since the introduction of red deer ca. 50 years ago, and argue that control of deer populations is not of itself enough to stop the admitted deterioration and erosion that they have caused. The existing forest is largely the result of deer browsing, is quite distinct from the previous natural forest, and may now be dependent on a stable deer population for its regeneration, e.g. by ensuring sufficient illumination.

4769. REISCH, J. Die "Distel", ein neues Fegeschutzmittel. [**The "Distel", a new protective**

device against deer rubbing.] *Forst- u. Holzw.* 16 (7), 1961 (164). [G.]

The device, a thin metal sleeve with five projecting prongs, has given 95–100% protection in trials. It is available in two sizes, the smaller costing DM. 7.25 per 100.

4770. Ow, L. V. Hilfsmittel aus Kunststoff in der Forstwirtschaft. [**The use of synthetic materials in forestry.**] *Allg. Forstzeitschr.* 16 (16), 1961 (264–6). 2 refs. [G.]

Describes: (*a*) the use, in England, of durable nylon netting, of 6-in. mesh and 7 ft. high for deer fences; as it can be tied to trees by nylon ropes, it is easily erected or removed, is cheaper than wire netting, and also less dangerous to fleeing game, but is liable to be misappropriated by poachers; (*b*) the use of black polythene sheets for mulches in nurseries [cf. *F.A.* 22 p. 5] including the transplanting of nursery stock into cross-slits in the sheets.

452. Birds

See Nos. 4210, 4759.

453. Insects

4771. McLeod, J. M., and Blais, J. R. **Defoliating insects on field Spruce in Quebec.** *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (2).

Gives data on populations of defoliating insects on *Picea glauca* in the Gaspé Peninsula and S.W. Quebec in 1959. Some 13 species were identified.

4772. Cap, L. I. Vtoričnye vrediteli dubovyh lesov Kryma. [**Secondary insect pests of Oak stands in the Crimea.**] *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (46–61). 16 refs. [Russ.]

Lists 33 secondary pests, indicating the most important ones (*Cerambyx cerdo acuminatus* is the worst), and gives data on the damage caused and the effect of BHC and DDT sprays. Where it is impossible to carry out sanitation fellings to control *C. c. acuminatus*, the best treatments are basal sprays of BHC in diesel-oil or mineral-oil emulsion. Measures for chemical control of other secondary pests are also discussed. Cattle grazing should be prohibited in foci of *C. c. acuminatus* infestation, and in protective and amenity forests; Oak coppice stands should be converted to high forest.

4773. Richter, D. Die Diagnose von Insektenschäden in Weidenkulturen. [**Recognition of insect damage on Osier Willows.**] *Forst u. Jagd* 11 (3), 1961 (125–32 + 2 plates).

A brief key to injuries to buds, shoots and stools, with a list of >65 pests, notes on their habits, appearance, economic importance etc., and a section on control.

4774. Merker, E. Welche Ursachen hat die Schädigung der Insekten durch Düngung im Walde? [**What causes the injurious effect of forest fertilizing on insects?**] *Allg. Forst- u. Jagdztg.* 132 (3), 1961 (73–82). 29 refs. [G.g.e.]

Discusses the mechanisms of the effects, injurious in the case of barkbeetles, sawflies and certain lepidoptera, beneficial in the case of aphids (including *Adelges*) and mites, of mineral fertilizers and of improving the host's water supply, and of the sometimes contradictory effects of the weather. The wet summer of 1960 caused a collapse of populations of Silver Fir *Adelges*, attributed to the high susceptibility of young larvae to water, and of sawflies. Lachnids, whose larvae were protected by foliage, increased in density. In trials in which 50-year-old Spruce, heavily infested with *Pristiphora abietina*, were treated with urea (500 kg./ha.) [cf. *F.A.* 19 No. 4578], the cumulative effect of weather and treatment caused a 90% reduction in pupal density vs. 60% in controls. From the fact that pupal sizes did not differ significantly, and that in the laboratory the youngest larvae had the highest mortality on fertilized foliage, it is concluded that starvation or nutrient deficiency are not the cause of mortality. This view was corroborated by experiments with foliage fertilized with N and Ca and fed to *Lymantria dispar* larvae, in which larval growth was more rapid and mortality less on finely comminuted food than on whole needles; the difference was greatest with Ca, where mortality was also greatest, suggesting that the fertilized food contained sufficient nourishment and that some of the injurious effects might be due to structural changes, particularly with Ca (accelerated lignification), which are partly offset by comminution. When larvae of *L. dispar* and *Lasiocampa quercus* were fed on young Oak and Spruce nourished with labelled P and Ca fertilizers, accumulations of P in the skin and midgut and of Ca in the Malpighian tubes were observed, suggesting that a disturbed nutrient balance might lead to organic disturbances. In the author's experiments, *Bupalus piniarius* was resistant to fertilizers. [Cf. *F.A.* 21 No. 3133.]

4775. Oldiges, H. Waldbodendüngung und Kronenfauna. [**Forest fertilizing and the fauna of the canopy.**] *Z. angew. Ent.* 47 (1), 1960 (57–60). 10 refs. [G.e.] O.H.

Whereas N fertilization increased larval mortality in *Dendrolimus pini* and *Panolis flammea* [cf. *F.A.* 21 No. 3133], no effect was observed on *Lymantria dispar* in Beech and Oak stands, possibly because treatment (in April of the same year) had not yet had time to affect the trees.

4776. Schwenke, W. Über die Wirkung der Walddüngung auf die Massenvermehrung der Kiefernbuschhornblattwespe (*Diprion pini* L.) 1959 in Mittelfranken und die hieraus ableitbaren gradologischen Folgerungen. [**The effect of fertilizing on the 1959 outbreak of *D. pini* in Central Franconia, and conclusions drawn therefrom.**] *Z. angew. Ent.* 46 (4), 1960 (371–8). 10 refs. [G.g.e.] O.H.

Preliminary report on a sudden outbreak of *D. pini* and other *Diprion* spp. in fertilizer trials on poor diluvial sands [cf. *F.A.* 21 No. 3133]. Pupal densities per sq. m. were 94 on an NPKCa plot with N as $(NH_4)_2SO_4.NH_4NO_3$, 136 on an NPKCa plot with N as NH_3, and 192 on controls; mean pupal diameters followed the same order. It is suggested that it is the quantity of reducing sugars in the foliage (which is decreased by fertilizing) that affects insect densities.

Insects: Natural and Biological Control

See also Nos. 4759, 4787, 4793, 4798, 4804–7, 4815–7, 4821, 4826, 4828, 4832, 4847, 4854, 4856, 4859–61, 4865.

4777. NEF, L. Les moyens de lutte en entomologie forestière. **[Control measures in forest entomology.]** *Bull. Soc. For. Belg.* 68 (2), 1961 (97–126). 67 refs. [F.f.]

A theoretical discussion, with particular reference to the desirability or otherwise of chemical methods of control, and stressing the greater possibility of biological control in the forest than in other forms of crop.

4778. **Research report, 1956–1959 Entomology Research Institute for Biological Control, Belleville, Ontario.** Department of Agriculture, Ottawa, Canada. 1960. pp. 45.

Summarizes the scope and results of work during the 4 years, and the functions and development of the Institute (whose first report this is). There is a list of publications issued since a biological control laboratory was established at Belleville in 1929. Research reports will in future be biennial. Citation in *F.A.: Res. Rep. Ent. Res. Inst. Biol. Control, Belleville, Ont.*

4779. LEWIS, F. B. **How to collect and process small polyhedral viruses of insects.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 109, 1960. pp. 8.

Detailed instructions applying to insects containing polyhedral bodies of $\leqslant 5\ \mu$; most sawfly polyhedroses (e.g. of *Neodiprion sertifer*, *N. lecontei*, *N. pratti*) fall in this size range.

4780. ČAPEK, M. Zoznam parazitov dochovaných z hmyzích škodcov vo VÚLH v Banskej Štiavnici. Čast I—Hostitelia lumčíkov. **[List of parasites reared from insect pests at the Forestry Research Institute at Banská Štiavnica. I—Hosts of the Braconidae.]** *Ved. Práce Výskum. Úst. Lesn. Hosp., Bansk. Štiav.* No. 1, 1960 (199–212). [Slovak. russ.g.]

Lists 94 species of Braconidae reared from 115 species of insect pest in Slovakia in 1953–58. The Braconidae are listed (*a*) by hosts, and (*b*) systematically, with brief bionomic notes in coded form.

4781. **[Biological control of forest insects with ants of the *Formica rufa* group.]** *Entomophaga, Paris* 5 (1), 1960 (9–86). Many refs. [G.f.it.] O.H.

A special number, including, after an introduction in English by *M. Pavan*, papers on: Modern methods of distinguishing forms of the *Formica rufa* group (*K. Gösswald* and *G. Schmidt*) [including biological and biochemical methods]; Tests with radioactive isotopes on ants of the *F. rufa* group (*K. Gösswald* and *W. Kloft*); The trophobiosis of *F. rufa* and aphids, and the interactions of aphids and host tissue (*W. Kloft*); Honeydew as food of hill-building *F. rufa* forms (*H. Müller*) [including observations on the seasonal pattern of ant activities and damage to trees, mainly young Spruce and Pine]; Relationships between birds and ants of the forest (*H. Bruns*) [no competition for food has been proved over 8 years]; Principles of ant propagation in Germany (*R. Lange*) [recommending the use of *Formica polyctena*].

4782. LANGE, R. Modellversuche über den Nahrungsbedarf von Völkern der kahlrückigen Waldameise *Formica polyctena* Först. **[The nutrient requirements of *F. polyctena* populations.]** *Z. angew. Ent.* 46 (2), 1960 (200–8). 26 refs. [G.g.e.] O.H.

When ants in the laboratory were fed on honey and insect larvae, they throve; on honey only, populations declined. It is concluded that honeydew alone would likewise be insufficient, a fact of potential importance for the survival of colonies in pure conifer stands, where supply of insects may at times be short. *From author's summary.*

4783. TURČEK, F. J. Niektoré aspekty vzťahov vtáctva, hmyzu a drevín z hľadiska biologickej ochrany lesa. **[Some aspects of the interrelationships of birds, insects and trees, from the point of view of biological protection of the forest.]** *Ved. Práce Výskum. Úst. Lesn. Hosp., Bansk. Štiav.* No. 1, 1960 (259–80). 42 refs. [Slovak.slovak.russ.e.]

From the literature, and the author's own published and unpublished data, an evaluation is made of the interrelationships of birds, insect pests, and woody species. The material used refers to 95 species of European birds, and 121 species of insect pests. Birds are classed as polyphagous (feeding on $\geqslant 13$ species of the insects under consideration) and oligophagous (feeding on 1–12 species). Insects are classed as preferred (eaten by $\geqslant 11$ bird species) and less preferred (eaten by 1–10 bird species), and also as oligophagous (feeding on 1–9 host species) and polyphagous (feeding on $\geqslant 10$ hosts). The shortcomings of the data, e.g. inadequate material, local variability, etc., are discussed. A relatively small group of 24 polyphagous birds feeds on a wide variety of insects (113 pest species), whereas a relatively large group of 71 oligophagous birds feeds on a smaller group of 68 pest species. This phenomenon, which the author calls 'ecological reciprocity', is discussed. For balanced control of insects, the bird population should include both oligophagous and polyphagous birds. Examination of 960 nests (56 bird species) in 31 tree and shrub genera in Slovakia showed that the preferred genera for nesting were *Quercus*, *Sambucus*, *Robinia*, *Populus*, *Fagus*, *Crataegus*, *Ulmus*, *Prunus*, *Salix*, etc. 'Ecological reciprocity' is evident here, too: a relatively small number of bird species uses a wide variety of woody species for nesting, whereas many bird species nest in relatively few woody species.

4784. PROKOF'EVA, I. V. O roli različnyh bespozvonočnyh i pozvonočnyh životnyh v pitanii ptencov nekotoryh lesnyh ptic. **[The role of different invertebrates and vertebrates in the diet of the young of certain forest birds.]** *Dokl. Akad. Nauk SSSR* 136 (2), 1961 (497–9). 1 ref. [Russ.] O.R.S.

An analysis, by bird species and by category of food animal, of the food of the young of 36 forest bird species in the south Leningrad region in 1955–59. By binding the necks of the young, or by stomach analysis, 27,635 items of food were examined. Insects made up most of this total, followed by spiders; insects were found in all 36 species, spiders in 31, snails in 28, myriapoda in 21, and harvestmen in 11. Vertebrates were taken by 5 species.

4785. HERBERG, M. Drei Jahrzehnte Vogelhege zur Niederhaltung waldschädlicher Insekten durch die Ansiedlung von Höhlenbrütern. [**Three decades of fostering bird life for the suppression of injurious forest insects through colonization by hole nesters.**] *Arch. Forstw.* 9 (11), 1960 (1015–48). 27 refs. [G.g.russ.e.]

[Cf. *F.A.* 21 No. 718.] Reports in great detail the circumstances and effects of nest-box breeding in 169 ha. of Pine and 200 ha. of Oak forest from 1926 to 1958 at the Steckby bird-watching station 10 miles up the Elbe from Magdeburg. From examinations in spring (and autumn from 1944 onwards) data are recorded for numbers of boxes, number occupied, density/ha. of breeding species, and (from 1944) young birds reared and disturbed nests. The distribution % of breeding pairs (1926–58) in Pine (first figure) and Oak (second figure) was: pied flycatcher (63·3, 40·9), all tits (17·6, 23·3), hedge sparrows (4·6, 16·0), starlings (6·6, 15·1), redstart (6·5, 1·8), wryneck (0·7, 0·2), nuthatch (0·3, 2·0), tree-creeper (0·4, 0). Counts of pupae/sq. m. of *Bupalus pinarius* in Pine stands both (*a*) within and (*b*) outside the protected area, over the same period, show adequate control for (*a*). In (*b*) resort had to be made to chemical control. Similar control by birds is indicated for *Tortrix viridana* on Oak, but more study is needed. Notes are given on the food and habits of individual species, and of control of nesting species by entrance-hole diameter. The pied flycatcher is considered extremely useful and even the hedgesparrow helps.

4786. STEIN, W. Biozönologische Untersuchungen über den Einfluss verstärkter Vogelansiedlung auf die Insektenfauna eines Eichen-Hainbuchen-Waldes. [**The effect of artificially increased bird densities on the insect fauna of an Oak/Hornbeam forest.**] *Z. angew. Ent.* 46 (4), 1960 (345–70); 47 (2), 1960 (196–230). 90 refs. [G.g.e.] O.H.

Lists catches, by various methods, of insects in the herbaceous and shrub layers of two 4-ha. plots differing materially only in bird densities—78 vs. 19 breeding pairs in one year, 83 vs. 27 in the next. Catches on the former plot were 30–40% lower, parasites being most affected (54% reduction). There was no difference for *Tortrix viridana* (in a latency stage) but for *Operophtera brumata* it was ca. 50% for both larvae and adults.

Insects: Silvicultural Control

See also Nos. 4774–6, 4804, 4806, 4863.

4787. VOÛTE, A. D. Cultuurmaatregelen die de weerstand van te bossen tegen insektenplagen verhogen. [**Methods of stand treatment to increase resistance to insect attack.**] *Ned. Bosb. Tijdschr.* 33 (1), 1961 (11–20). 22 refs. [Du.]

Methods discussed include: use of fertilizers and avoidance of measures (e.g. excessive cultivation, opening a stand to drying winds) likely to affect moisture relations; use of early- or late-flushing varieties; and encouragement of natural predators and parasites.

Insects: Chemical Control (General)

See also Nos. 4792, 4795, 4802, 4806, 4813, 4818–9, 4827, 4831–2, 4837–8, 4843–4 4851–3, 4856, 4858, 4864.

4788. SCHREAD, J. C. **Control of leaf miners.** *Circ. Conn. Agric. Exp. Sta.* No. 215, 1961. pp. 16. 7 refs.

Describes tests with various foliage sprays on pests of ornamentals, including *Fenusa pusilla* on Birch, *Phytomyza ilicis* on Holly, *Argyresthia thuiella* on Arborvitae, *Monarthropalpus buxi* on Boxwood, *Cameraria hamadryadella* and *C. cincinnatiella* on Oak, etc. Diazinon, used in most of the tests, was generally very effective. So were ethion and Trithion. [Cf. *F.A.* 19 No. 4582.]

4789. AL-AZAWI, A. F., DALE, M. N., and CASIDA, J. E. **Hazards associated with the implantation of Tetram into Elm trees for Dutch Elm disease control.** *J. econ. Ent.* 54 (1), 1961 (127–9). 6 refs.

Tetram (0,0-diethyl S-(β-diethylamino)-ethyl phosphorothiolate hydrogen oxalate) used thus is effective through its control of the barkbeetle vector. Leaves shed in the autumn after spring treatment are very toxic to mammals and earthworms ingesting them; even the smoke from burning such litter can cause cholinesterase depression in animals.

Orthoptera

4790. WILSON, L. F. **Grasshoppers—a major defoliator of trees and shrubs in the Northern Great Plains.** *Tech. Note Lake St. For. Exp. Sta.* No, 596, 1961. pp. 2. 1 ref.

Describes severe damage by *Melanoplus* spp. to shelterbelts in eastern N. and S. Dakota. In years of heavy populations, entire belts, including coniferous and deciduous trees, may be defoliated, and twigs, buds, and bark eaten off. Shrubs on the outer rows of belts, particularly *Caragana arborescens*, suffer badly. On farms, damage may be reduced by leaving a narrow strip of field crop next to the shelterbelt when harvesting; poison bait and insecticides can then be applied to the strip so as to kill the migrating grasshoppers before they reach the trees.

Isoptera

4791. ZONDAG, R. **Attack by *Calotermes brouni* on living *Pinus radiata*.** *New Zealand Entomologist, Nelson* 2 (4), 1959 (15–7). I.I.E.

This dry-wood termite native to New Zealand has been found attacking over-mature *P. radiata* in farm woodlots and shelterbelts. Infestation, starting from dead branches and snags, sometimes continued into the heartwood, making it unfit for conversion. In one mixed stand, *P. radiata* was attacked, but not *P. nigra* or Douglas Fir; attacks on *Cupressus macrocarpa* are common. No infestation of live *P. radiata* in forest plantations by *C. brouni* or by introduced dry-wood or subterranean termites have been reported, but *Stolotermes ruficeps*, a native wet-wood termite, sometimes breeds in dead *P. radiata* and other exotic conifers.

Thysanoptera

4792. Vité, J. P. Zur Prognose und Bekämpfung des Lärchenblasenfusses. **[Forecasting outbreaks of *Taeniothrips laricivorus*, and its control.]** *Allg. Forstzeitschr.* 16 (11), 1961 (202–4). 11 refs. [G.]

Briefly discusses the prospect of a renewed outbreak of *T. laricivorus* in N.W. Germany, its biology, hosts, and chemical control, and describes successful experiments with Metasystox, applied to one side only of the stem from a low-pressure knapsack sprayer with a wide nozzle. In a 10-year-old mixed stand, larval densities on the top 10 cm. of leaders, 23 days after a June treatment, were 0 with a concentration of 20%, 2·4 with 10% and 15 with 5% against 41 for controls. A 10% solution, applied at ca. 10 c.c. per metre of stem sufficed to prevent serious damage. The method, which uses about as much poison as bandaging or injecting [cf. *F.A.* 18 No. 3076], but less water than bandaging, is much faster, one man being able to treat ca. 200 trees in mixed stands per hour, using ca. 15 litres of solution. But because of effects of dilution and chemical modification in the sapstream (for which some estimated data are presented) it is not applicable to trees >8 m. high or >12 cm. in d.b.h., and its effect on *Coleophora laricella* is doubtful.

Hemiptera

See also Nos. 4026, 4774.

4793. Pschorn-Walcher, H., and Zwölfer, H. **Further observations on European *Dreyfusia* (*Adelges*) populations.** *Z. angew. Ent.* 46 (3), 1960 (260–73). 24 refs. [E.e.g.] O.H.

A further contribution to the controversy with Karafiat and Franz [cf. *F.A.* 20 No. 4848] on mortality factors, briefly summarizing the authors' investigations and predator collections in Switzerland, S. Sweden, Germany, and Slovakia. In discussing systematics, they report the presence of *D. merkeri* in S. Sweden. Predator complexes were found to be very uniform for each *Adelges* species within the natural range of Silver Fir, but much poorer in species outside. The authors conclude that the differences in observations may be due partly to differences in species (Karafiat and Franz agree, in a postscript, that the population observed was *D. merkeri*), habitat, and intensity of infestation.

4794. Joly, R. Les causes animales dans le jaunissement et la chute des aiguilles de l'épicéa de Sitka "*Picea sitchensis*" et d'autres épicéas. **[The animal causes of yellowing and needle-cast of *P. sitchensis* and other Spruces.]** *Rev. for. franç.* 13 (3), 1961 (179–86). 12 refs. [F.]

Describes biology, life history, damage, and control of *Liosomaphis* [*Neomyzaphis*] *abietina* and *Paratetranychus ununguis*.

4795. Küthe, K., and Krämer, K. Zur Bekämpfung der Buchenwollschildlaus (*Cryptococcus fagi* Bär.) mit chemischen Mitteln. **[Control of *C. fagi* by chemical means.]** *Anz. Schädlingsk.* 34 (3), 1961 (42–3). 3 refs. [G.g.]

One spraying with (1) Folidol oil 0·5%, (2) Selinon 1%, or (3) Gusathion A 0·1% gave complete kill of *C. fagi* on Beech stems up to a height of 4–6 m. Metasystox, as a spray (0·1%) or applied via an impregnated bandage (5%), and malathion (2%) gave unsatisfactory results. (1) and (2) can be used at any season; untimely use of (3) may damage ground crops.

4796. Maksimović, M. Napad štitaste vaši *Physokermes piceae* Form. u smrčevim šumama Kopaonika. **[Attack of the scale insect *P. piceae* in the Spruce forests of Kopaonik.]** *Zašt. Bilja* No. 57/58, 1960 (177–81). 4 refs. [Serb.serb.e.*e*.] I.M.I.

Describes studies during a severe outbreak of *P. piceae* affecting 1500 ha. of pure *Picea abies* forest at 1100–1700 m. alt. on Mt. Kopaonik, Serbia. Sample counts showed 73–100% of mature trees and 55–93% of regeneration to be affected. The yellowing of needles, frequently associated with attack and suggesting serious physiological decline, could be ascribed to no other cause. Counts indicated larval populations of 1·9–6·1 million per infested tree. [Cf. *F.A.* 18 No. 3085.]

4797. Mitić-Mužina, N. Mogućnost održavanja šljivine štitaste vaši u šumama. **[*Parthenolecanium* [*Eulecanium*] *corni*: its ability to persist in forests.]** *Zašt. Bilja* No. 57/58, 1960 (73–84 + 2 photos). 10 refs. [Serb.serb.e.*e*.] I.M.I.

Morphology and host plants of *P. corni* in Serbia were studied during the 1952–59 outbreak. The important potential hosts were: (*a*) Plum; (*b*) *Quercus robur*; (*c*) *Castanea sativa*; and (*d*) *Robinia pseudoacacia*. The main scale insect attacking (*b*) and (*c*) was *P. rufulum*. When transferred from (*a*) to (*b*), *P. corni* was able to survive, but development was poor, and (*b*) was considered a casual host, unimportant in supporting latent populations or in outbreaks. *P. corni* attacked stands of (*d*). It differed in biology and morphology on (*a*) and (*d*), but could be readily transferred from one to the other. For this reason, the proximity of (*d*) represents a permanent danger of outbreak to (*a*). *Amorpha fruticosa* also favoured development of *P. corni* and should be destroyed in the neighbourhood of (*a*). Other forest trees and shrubs, including Ash, Maple, Hazel, and Lilac, on which severe attacks of *P. corni* have been recorded, played little part in its maintenance and spread. *P. rufulum* failed to develop on (*a*) when transferred experimentally, and probably could not do so in nature.

Lepidoptera

See also Nos. 4027–9, 4159, 4308, 4774–5, 4785–6, 4788.

4798. Russo, G. I principali entomoparassiti dei lepidotteri defogliatori forestali in Italia e loro importanza economica. **[The principal insect parasites of the lepidopterous forest defoliators in**

Italy, and their economic importance.] *Ann. Accad. Ital. Sci. For.* 9, 1960 (139–51). [It.f.]

Notes on the insect parasites of *Euproctis chrysorrhoea*, *Lymantria dispar*, *Malacosoma neustria*, *Tortrix viridana*, *Thaumetopoea pityocampa*, *T. processionea*, and *Dendrolimus pini*.

4799. McLeod, J. M. ***Evagora canusella* Free. on Jack-Pine in Quebec.** *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (2–3).

A light infestation of a lepidopterous needle miner, *E. canusella*, was noted in a stand of 37-year *Pinus banksiana* in Quebec in 1960. It is of interest because this insect occupies an ecological niche similar to that of the economically important *E.* [*Recurvaria*] *starki* on the closely related *P. contorta* var. *latifolia*. Life history and habits are described.

4800. Lindquist, O. H., and Sippell, W. L. **Bud-miners. *Argyresthia* spp. on Spruce and Balsam Fir in Ontario.** *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (2).

During the past 3 years, two or more undescribed species of *Argyresthia* have been collected in increasing numbers in Ontario, on *Picea glauca*, *P. mariana* and *Abies balsamea*. Since they kill terminal buds of side branches, heavy infestations could perhaps affect tree growth and form.

4801. Šavelj, M. Topolov molj (*Phyllocnistis suffusella* Zell.). **[*P. suffusella*.]** *Gozd. Vestn.* 19 (1/2), 1961 (21–3). 3 refs. [Sloven.]

Observations on attacks by this leaf-miner of Poplar in Slovenia, its life history, the damage it causes, and control. [Cf. *F.A.* 21 No. 3442.]

4802. Bellis, E. de. Prove di lotta chimica contro la *Phyllocnistis suffusella* Z. **[Tests of chemical control of *P. suffusella*.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (225–30 + 3 plates). [It.it.e.]

Defoliation of Poplars in nurseries by this insect is increasing in Italy. Tests were made of control by summer sprays of systemic insecticides: parathion (Carposan 50), malathion (Matatox), diazinon (Basudin 60), demeton (Systox), Rogor, and a mixture of parathion and DDT (Didifos 50). All were effective, and, having regard to cost, it is suggested that Didifos 50 (300 g./hectolitre of water) and Carposan 50 (150 g./hl. of water) might be the most satisfactory to use.

4803. Schönherr, J. Biologie und Morphologie von *Ectoedemia liebwerdella* Zimmerm. unter Berücksichtigung der übrigen rindenminierenden Nepticuliden. **[Biology and morphology of *E. liebwerdella* and other bark-mining Nepticulidae.]** *Deutsche Entomologische Zeitschrift, Berlin* (*n.s.*) 5 (1/2), 1958 (1–71). 33 refs. [G.] I.I.E.

A full account of research briefly described in another paper [see *F.A.* 20 No. 3430].

4804. Pointing, P. J. **Mortality of the European Pine shoot moth [*Rhyacionia buoliana*] associated with the severe winter of 1958–1959.** *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (2–3).

Results of a study in S. Ontario indicate that mortality resulting from low minimum temperatures may be modified by the snow depth, the height of infested trees, and the crown closure of the stand. A possible control measure, where low winter temperatures are frequent, would be the removal of the snow, or of all branches up to a height of 4 ft.

4805. Béique, R. **The importance of the European Pine shoot moth, *Rhyacionia buoliana* (Schiff.) in Quebec City and vicinity.** *Repr.* from *Canad. Ent.* 92 (11), 1960 (858–62). 9 refs.

R. buoliana was first found in Quebec City in 1954 on *Pinus mugo*, and in numbers sufficient to warrant an investigation into parasites and other control factors. Results are presented of rearings from larval and pupal collections of *R. buoliana* over 1955–59. Of the larvae, >60% were parasitized, mainly by *Orgilus obscurator*, which is well established and more effective than in other parts of the country. During the winter, all *R. buoliana* larvae above snow level were killed by the cold. For these reasons the pest is not likely to become economically important in Quebec.

4806. Yates, H. O., III. **The Nantucket Pine moth *Rhyacionia frustrana* (Comst.): a literature review.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 115, 1960. pp. 19. 58 refs.

Covers nomenclature, distribution, hosts, description, life history, damage, and control (chemical, silvicultural, and natural, including a parasite list).

4807. Gerig, L. Zur Morphologie der Larvenstadien einiger parasitischer Hymenopteren des grauen Lärchenwicklers (*Zeiraphera griseana* Hübner). **[The morphology of the larval stages of some hymenopterous parasites of *Semasia diniana*.]** *Z. angew. Ent.* 46 (2), 1960 (121–77 + 1 tbl.). 18 refs. [G.g.f.e.] O.H.

Describes, with a key to the fifth instar, and a table of macro- and micro-morphological characters (particularly of the head capsule), 2 ecto- and 8 endoparasitic ichneumonid larvae, and some eggs.

4808. Beckwith, R. C., and Duda, E. J. **Notes on leaf tiers of Oak and Black Locust.** *Sci. Tree Topics* 2 (8), 1961 (1–2).

Notes on *Argyrotoza semipurpurana* defoliating *Quercus palustris*, and *Agonopterix robiniella* defoliating *Robinia pseudoacacia*, both increasing in the N.E. United States.

4809. Schmiege, D. C. **Mortality and top killing of Spruce-Fir caused by repeated budworm defoliation.** *Tech. Note Lake St. For. Exp. Sta.* No. 597, 1961. pp. 2.

It was noted in 1958 that some White-Spruce/Balsam-Fir stands in remote country in N. Minnesota were grey in colour instead of the brown usual in heavy infestations of *Cacoecia fumiferana*. Investigation showed that these trees not only sustained heavy current feeding, but had had heavy to complete defoliation for at least 2 years previously. This condition, classed as severe defoliation, is increasing each year, and in 1960 affected 96,000 acres in the Spruce/Fir type. Data from ⅐- to ⅓-acre plots established in Sept. 1960 showed as many as 78% of trees with top kill and tree mortality of 2·4 cords/acre. [Cf. *F.A.* 18 No. 3092.]

4810. Bean, J. L. **Predicting emergence of second-instar Spruce budworm larvae from hibernation under field conditions in Minnesota.** *Ann. Ent. Soc. Amer.* 54 (2), 1961 (175–7). 7 refs. O.R.S.

Laboratory studies indicated that ca. 2·5° C. was the threshold temperature initiating diapause termination. Using this temperature as a base, it was possible to calculate from standard thermograph records the degree-hours that would establish the approximate date when first larval emergence could be expected in the field. Comparison of calculated and observed dates for 4 seasons showed errors of only 1–2 days in the calculations.

4811. Lebrun, R. Quelques notes sur une épidémie de tordeuse du sapin "*Tortrix murinana*". **[An outbreak of *Cacoecia murinana* on Silver Fir.]** *Rev. for. franç.* 13 (3), 1961 (171–8). [F.]

Describes an outbreak in the Fir stands of Alsace which has lasted for some years and caused considerable mortality. Most vulnerable are old trees on warm sites, and it is considered that the extent of the damage is due to Fir having invaded sites where it should not be tolerated except as an understorey.

4812. Omagiului Traian Săvulescu cu prilejul împlinirii a 70 de ani. **[In honour of Traian Săvulescu on his 70th birthday.]** Editura Academiei Republicii Populare Romîne, Bucharest. 1959. pp. xxxvii + 1179. Many refs. [Rum., G., E., or F.] I.M.I.

Contains ca. 100 papers, in a variety of languages, on plant physiology, pathology, and ecology, pedology, mycology, entomology. Amongst them are: The mass infestation of *Cacoecia murinana* on Silver Fir in 1958 (*G. Eliescu*) [Rum.russ.f.]; A wilt (*Verticillium albo-atrum*) of *Quercus cerris* (*C. C. Georgescu*, *S. Oreaschi* and *M. Petrescu*) [Rum.russ. f.]; Origin and evolution of the forests of the Călmătiu-Siret plain following the disappearance of the great Rumanian lake (*I. Serbanescu*) [Rum.russ. f.]; Ecological studies of the soil macromycetes in several Hungarian forest types (*G. Ubrizsy*) [G. russ.]; The nutritional series of genetical soil types of the Rumanian forest zone (*N. Cernescu*) [Rum. russ.f.].

4813. Charvát, K., and Patočka, J. K priebehu kalamity obal'ovačov (*Choristoneura murinana* Hb. a *Epinotia nigricana* H.S.) v jedlinách stredného Pohronia. **[The course of the outbreak of *Cacoecia murinana* and *Epiblema nigricana* in the Silver Fir forests of the central Hron area.]** *Ved. Práce Výskum. Úst. Lesn. Hosp., Bansk. Štiav.* No. 1, 1960 (215–29). 4 refs. [Slovak.slovak.russ.g.]

Notes from 15 localities in central Slovakia show that the outbreak of *C. murinana* began on the lowest, warmest sites in 1948, on intermediate sites in 1952–53, and on the higher, colder sites in 1954. Needle losses averaged 30% (maximum 70%) in a year. Everywhere, the *C. murinana* outbreak was followed 2–3 years later by a build-up of *E. nigricana* which deprived *C. murinana* of its food. Aerial chemical control, if done at the proper time, almost always caused a substantial reduction in the *C. murinana* population.

4814. Gądek, K. Charakter żerowania wyłogówki jedlineczki—*Choristoneura murinana* (Hb.) w zależności od ekologicznych warunków i roślin żywicielskich. **[The feeding habits of *C. murinana* in relation to ecological conditions and the host plants.]** *Ekologia Polska, Warszawa 7B* (1), 1961 (41–50). 8 refs. [Pol.g.] B.A.P.

Studies during an outbreak in Poland showed that stands at ca. 400 m. alt. were the most severely attacked. The best conditions for the pest were in thinned *Abies alba* stands ca. 100 years old, but if such stands were not available younger stands were attacked. *Picea abies*, *Pinus sylvestris* and *Juniperus communis* also suffered. Some data are given on climatic conditions during the outbreak.

4815. Gauss, R. *Tortrix viburniana* F. erneut als Forstschädling. **[*T. viburniana* once more a forest pest.]** *Z. angew. Ent.* 47 (1), 1960 (46–51). 11 refs. [G.e.] O.H.

Describes a recent outbreak of this insect (normally feeding on herbs and shrubs, but known to have attacked Pine in N. Germany and various conifers in Norwegian nurseries in the 19th century) on young Douglas Fir and, to a lesser degree, on young Spruce, in the Black Forest. Damage was not severe, most of the larvae feeding on recent needles of lower branches (not the leader) and after 2 years the outbreak died down, presumably because of high parasitization.

4816. Steger, O. Spätfröste und Massenwechsel von *Tortrix viridana* (Lep. Tortr.). **[The effect of late frost on population densities of *T. viridana*.]** *Z. angew. Ent.* 46 (2), 1960 (213–6). [G.e.] O.H.

A severe frost in the nights of 19th and 20th April 1959 in the Spessart caused little damage to *Quercus sessiliflora* on high ground (*a*) but killed all shoots and flushing buds in valley bottoms and lower slopes (*b*). In (*b*) only, larval densities were reduced by ca. 30% outright, and only 10–20% of the original population survived up to the secondary flush in early May. In both (*a*) and (*b*) pupal densities were only 5–10% of original larval densities, with a high rate of parasitization; the reduction in numbers in (*a*) is attributed to a disease, probably a bacteriosis, susceptibility to which may have been increased by the frost. Egg counts also yielded only 5–8% of the previous year's values (20–95 eggs/1000 buds).

4817. Schütte, F. Der Einfluss von Spätfrösten (1959) auf die Belaubung der Eichen und die Populationsdichte des Eichenwicklers. **[The effect of late frosts (1959) on the flushing of Oak and the population density of *Tortrix viridana*.]** *Z. angew. Ent.* 46 (2), 1960 (217–20). 2 refs. [G.e.] O.H.

[Cf. preceding abstr.] In the Rhein-Main area there was likewise little frost damage to foliage at high elevations and severe damage at low ones. No direct frost mortality of larvae was observed but, in the heavily damaged stands, starvation reduced densities by ca. 75%. The frost did not cause the outbreak to collapse. *From authors' summary.*

4818. Schwerdtfeger, F. Zur chemischen Bekämpfung des Eichenwicklers. **[Chemical control of *Tortrix viridana*.]** *Holz-Zbl.* 86 (148), 1960 (2097–8). 15 refs. [G.]

Reviews the experience gathered in recent large-scale operations in Germany, discussing insecticides (mostly DDT), methods of application (lately by helicopter), critical densities, timing, costs, mortality, recovery of populations, effect on parasites, effect on trees (mast, increment, epicormics), and economics, mainly on the basis of published work. [Cf. *F.A.* 22 No. 804.]

4819. **[Control of *Tortrix viridana*.]** *Extr.* from *Jber. StForstverw. Bayerns 1958* No. 28, 1960 (25). [G.]

Spraying, by helicopter, of a 25% DDT/oil solution immediately after foliage development, in two areas of the Spessart threatened with defoliation, achieved a 99% kill of the *T. viridana* larvae, thus preserving the foliage and, more important, the mast. Spraying before flushing, at the larval hatching stage, failed, as the spray did not adhere to the bare twigs. Costs were ca. DM.48/ha.

4820. Kolomiec, N. G., and Terskov, I. A. Ispol′zovanie ul′trafioletovogo svet dlja uničtoženija vreditelej lesa. **[Using ultra-violet light in the control of forest insect pests.]** *Lesn. Hoz.* 14 (1), 1961 (46–7). [Russ.]

Experiments have been made in the Tuva Autonomous Region on the use of ultra-violet light to trap adults of *Dendrolimus sibiricus*. The trap, set on a tripod, consists basically of ultra-violet lamps (fed from a dynamo) and a fan to suck the insects into a gauze sleeve leading to a collecting jar. Results were best in the middle of the night. Where the mean populations were 4 and 8 adults per crown, in one hour up to 2000 and 5000 insects respectively were attracted to the light. Best catches were made at air temperatures of 16–19° C. The lamp attracted well for distances up to 1 km., but was ineffective for distances ⩾3 km. It was found that ≯20% of all the adults attracted by the light were sucked in by the fan; most of the others concentrated within a radius of 5 m., where they were easy to kill by swatter or by dusts, aerosols or emulsions. It is thought best to have the lamp trap mounted on a vehicle and to work at night, stopping every 1½–2 km. to operate the trap.

4821. **Promising biological insecticide.** *Extr.* from *Rep. Intermt. For. Range Exp. Sta. 1960*, 1961 (17).

Bacillus thuringiensis has been used successfully against many types of caterpillar infesting agricultural crops, and it was decided to test it on populations of a forest pest, *Malacosoma fragilis*, in S. Utah. The bacillus was applied as a wettable powder containing 3000 million spores/g., at rates of 0·5, 1, 2, and 4 lb./acre, applied to foliage of *Amelanchier utahensis* surrounding caterpillar tents. All dosages produced satisfactory mortality of 90·9–100%. Results obtained show that *B. thuringiensis* can be used to control *M. fragilis*, but further experiment would be required to devise methods of applying it over extensive areas. [Cf. *F.A.* 21 Nos. 719, 3417, 3466; 22 p. 496.]

4822. Burns, J. M. **A new species of Oak-eating *Erynnis* (Lepidoptera: Hesperiidae) restricted to the southern Cordillera of the United States.** *Wasmann Journal of Biology, San Francisco* 18 (1), 1960 (147–60). 10 refs. O.R.S.

Describes *E. telemachus*, whose distribution in Colorado, Utah, Arizona and New Mexico coincides fairly closely with that of the host *Quercus gambelii*, and distinguishes it from other *Erynnis* spp.

4823. Drooz, A. T. **The Elm spanworm [*Ennomos subsignarius*] outbreak in the Southern Appalachians.** *Sth. Lumberm.* 201 (2513), 1960 (111).

A short account of the position in 1960, when moderate to severe defoliation occurred on 180,000 acres, and slight defoliation on 1½ million acres. In areas under attack for 4 years, tree mortality is becoming noticeable. [Cf. *F.A.* 21 No. 730.]

4824. Wylie, H. C. **Some factors that affect the annual cycle of the winter moth (*Operophtera brumata* Lepidoptera, Geometridae) in Western Europe.** *Entomologia Experimentalis et Applicata, Amsterdam* 3 (2), 1960 (93–102). 24 refs. [E.e.f.] O.H.

Discusses the effect of temperature on development in various countries of W. Europe, as reported in the literature, and laboratory tests with material originating in Sweden, Germany, France, Belgium and England, which indicate that higher temperatures, by shortening egg-, and lengthening pupal-development periods, cause the differences in annual cycle observed in the south as compared with the north. Differing reactions shown, by material from different localities, to identical environmental conditions suggested that genetic differences reinforce those of climate. *From author's summary.*

4825. Mikloš, I. *Pygaera anastomosis* L.—novi štetnik na topolama. **[*P. anastomosis*, a new pest of Poplars.]** *Šum. List* 84 (11/12), 1960 (368–70). 8 refs. [Croat.e.]

Gives description, and notes on biology and life history. Though defoliation by the pest has been noted for some 7 years, its most serious attack yet in Croatia occurred in 1959 on the 163-ha. 'Vijuš' plantation near Brod. It multiplies very rapidly, producing 3–4 generations a year. In laboratory tests, it preferred 'Canadian' Poplars to native species. As the former are now used on a large scale in plantations, damage from *P. anastomosis* can be expected to increase. [Cf. *F.A.* 22 No. 829.]

4826. Szmidt, A. Beiträge zur Biologie von *Dirhicnus alboannulatus* (Ratz.) (Hym. Chalcididae) als Grundlage einer Massenzucht für die biologische Bekämpfung. **[The biology of *D. alboannulatus* as a basis for its mass propagation for biological control.]** *Entomophaga, Paris* 5 (2), 1960 (155–63). 6 refs. [G.g.e.] O.H.

Describes breeding experiments with this chalcid, a frequent parasite of *Panolis flammea*, *Bupalus piniarius* and other forest pests. It could be bred in the pupae of 10 species, including 4 new hosts. Because of its fertility, fast development, and comparative longevity under suitable conditions, its mass breeding is considered promising.

4827. DŽUTESKI, B. Pojava i preduzete mere borbe protiv žutotrbe u NR Makedoniji u posleratnom periodu. **[Occurrence of, and control measures against, *Euproctis chrysorrhoea* in Macedonia in the post-war period.]** *Zašt. Bilja* No. 57/58, 1960 (239–44 + 2 photos). [Serb.e.] I.M.I.

Describes and maps outbreaks of *E. chrysorrhoea* in Macedonia since 1945. A mass outbreak, in its 4th year in 1959, on ca. 12,000 ha. of Oak (*Quercus sessiliflora* and *Q. cerris*), was used to test the efficacy of aerial mist-spraying with DDT and the practicability of aircraft on high (860–1300 m. alt.) and mountainous terrain. DDT (Aerosol 20), applied at 3 kg./ha. on May 23–31 over 3500 ha. of forest and 633 ha. of orchard, gave almost 100% kill of *E. chrysorrhoea* larvae. *Thaumetopoea processionea* larvae proved resistant, but in the orchards, where larval populations of *Yponomeuta malinella* were at high levels, 65–75% of this pest of apples were killed. [Cf. *F.A.* 18 No. 3107.]

4828. **[Gypsy moth.]** *Zašt. Bilja* No. 56, 1959. pp. 125. 40 refs. [Serb.e.] I.M.I.

An issue devoted to *Lymantria dispar* in Jugoslavia, mainly relating to 1959 and containing the following papers: Status of the gypsy moth in Jugoslavia in 1959 and forecast for 1960 (*K. Vasić* and *L. Janković*); Numerical frequency of the gypsy moth egg parasites *Anastatus disparis* and *Ooencyrtus kuwanae* in some Macedonian localities in 1958–59 (*M. D. Tadić*) [*O. kuwanae* was the more frequent, occurring in 13·3–15·5% of 52,000 eggs examined, vs. 0·6–2·4% for *A. disparis*]; Indicators of the status of latent gypsy moth populations (*K. Vasić* and *L. Janković*); Investigations on pathogenic micro-organisms on gypsy moth in 1959 (*L. Schmidt*); Influence of temperature and humidity on the development of gypsy moth larvae at time of moulting (*L. Schmidt*); Effect of temperature on gypsy moth diapause (*K. Vasić* et al.); Traps—a modern method of controlling the level of gypsy moth populations (*M. Maksimović*) [population levels can be estimated from the number of ♂s caught at sample sex-attractant traps, and control measures applied where necessary]; Effects of abiotic factors on gypsy moth population in the Jakovački Ključ forest in 1959 (*M. Maksimović* and *M. Janković*); Two-year fluctuation in gypsy moth populations in various regions in Serbia following epizootic diseases of the polyhedral type (*L. Vasiljević*); Research into the dynamics of gypsy moth populations in 1959 in localities where no control has been undertaken (*E. Georgijević* et al.); Foci of infestation in Bosnia and Herzegovina (*E. Georgijević* et al.); Chemical investigation into the active [attractant] substance from the female (*D. Stefanović* and *B. Grujić*); Races of the gypsy moth in Jugoslavia—annual report 1959 (*M. Janković, D. Zecević*, and *V. Vojnović*); Quantitative ecological studies on gypsy moth at Jakovački Ključ—annual report 1959 (*L. Janković*); Ecological studies of tachinid parasites of the gypsy moth—annual report 1959 (*P. Sisojević*); Investigations into gypsy moth prepupae and pupae in Jugoslavia—annual report 1959 (*P. Sisojević*) [main mortality factor was the tachinid *Blepharipoda scutellata*]; Comparative ecological investigations into the gypsy moth in lowland, hilly, and mountainous biotopes at Ada Huja, Trstena near Mladenovca, Fruška Gora, Mokra Gora and Kopaonik (*D. Zecević, L. Janković*, and *P. Sisojević*). [Cf. *F.A.* 21 No. 3469.]

4829. JANKOVIĆ, L. Vertikalna distribucija gubara (*Lymantria dispar* L.) i njegovo ponašanje. **[The vertical distribution of *L. dispar* and its behaviour.]** *Zašt. Bilja* No. 57/58, 1960 (203–9). 10 refs. [Serb.serb.e.e.] I.M.I.

From data from Serbia, describes differences in population dynamics and phenology of *L. dispar* in 3 altitude zones: (*a*) lowland, ⩽500 m.; (*b*) hilly, 500–1200 m.; and (*c*) mountainous, ⩾1200 m. *L. dispar* finds optimum conditions in (*a*). Here outbreaks are common, lasting 3–5 years and leaving extensive areas completely defoliated. The larval stage lasts 45–60 days. The ♀s lay most eggs (ca. 700 per ♀) when the population is increasing, and least (ca. 200) when it is decreasing. In (*b*), the larval stage lasts 60–70 days, depending on climate. Outbreaks occur, and last 2–3 years, but fewer insects are found per unit area, and completely defoliated areas are rare. Protogyny is quite common, being found in 23% of cases. Mean ♀ fertility is high; studies showed a mean of 689 eggs per ♀, of which 16·8% were infertile. In (*c*), populations remain at a constant level. The larval stage lasts ca. 90 days. Protogyny is normal and may reach 100%. Mating and oviposition occur in hidden places, particularly under stones, and *Carabus hortensis*, a predator of the larvae, was found to eat adults also in such places. [Cf. *F.A.* 17 No. 632.]

4830. JACOBSEN, M. **Synthesis of a highly potent gypsy moth sex attractant.** *J. organ. Chem.* 25 (11), 1960 (2074). 5 refs. O.R.S.

12-acetoxy-1-hydroxy-*cis*-9-octadecene has been found to be a highly potent attractant and to compare favourably with the activity of the natural attractant [cf. *F.A.* 21 No. 4672], which is extremely costly to prepare.

4831. SPAIĆ, I. Djelovanje subletalnih doza insekticida na populaciju gubara prigodom zamagljivanja šuma. **[The effect on the *Lymantria dispar* population of sublethal doses of insecticide in [aerial] mist-spraying of forests.]** *Zašt. Bilja* No. 57/58, 1960 (215–24). 16 refs. [Serb.serb.g.] I.M.I.

In trials in forests in the central Sava basin, N. Jugoslavia, in 1956–58, aerial mist-spraying of 4th- to 6th-instar larvae with 2·5 kg./ha. of a preparation containing 5–25% DDT, failed to kill them. Populations were reduced, however, because the mean number of eggs laid per cluster decreased and there was heavy mortality of egg-larvae (defined as fully formed larvae still within the egg). Smaller clusters were laid because, as the insecticide was immobilized in the fat-body of the larvae, energy reserves were reduced and the constitution of the adults developing from the larvae was weakened. Egg-larvae were killed either directly (by particles of insecticide transferred from the fat-body to the egg in fat globules forming part of the deutoplasm) or in outbreaks of the latent polyhedrosis virus amongst insects weakened by DDT. [Cf. *F.A.* 14 Nos. 2464–6; Ž. Kovačević in *F.A.* 22 No. 769.]

4832. Halperin, J. **The Pine processionary caterpillar: (*Thaumetopoea wilkinsoni* Tams.): Progress report and instructions for control 1959/60.** *Leafl. Dep. For. Israel* No. 12, 1960. pp. 4 + 1 map. 4 refs. [E.e.]

Notes on distribution in Israel, damage to Pines (defoliation), human diseases caused by the larvae, and chemical, and biological control trials. Mechanical removal of the eggs, and sprays or dusts of DDT and dieldrin are recommended for control. *Pinus brutia* is less susceptible than *P. halepensis.*

Coleoptera

See also Nos. 4104–5, 4772, 4789, 5159, 5178–80.

4833. **The Elm leaf beetle [*Galerucella xanthomelaena*].** *Leafl. U.S. Dep. Agric.* No. 184 (rev.) 1960. pp. 4.

Identification, life history and habits, and control.

4834. Saito, T., and Kojima, K. **[Notes on morphology of *Anaglyptus subfasciatus* Pic. larvae and examples of damage done to *Cryptomeria* trees.]** *J. Jap. For. Soc.* 42 (9), 1960 (335–8). [Jap.e.]

Morphology and damage to *C. japonica* are described. No relation was found between damage done by the cerambycid larvae and branch length and thickness, or branch height from ground. The larvae are secondary pests, attacking weakened trees.

4835. **Irradiation of Black Locust borer with cobalt 60.** *Extr.* from *Rep. Cent. St. For. Exp. Sta. 1960*, 1961 (14).

The influence of radiation on the sexual activities of *Megacyllene robiniae* was experimentally investigated by subjecting ♂ and ♀ beetles to γ-ray emission from Co^{60}. With treatment rates of 1000, 5000, 10,000, and 15,000 r there was no adverse effect on fertility, but a dosage of 15,000 r appeared to be the threshold beyond which fecundity might be reduced. [Cf. *F.A.* 20 Nos. 3411, 4898.]

4836. Lekić, M. Rojenje, polaganje jaja i potencijal razmnožavanja vrbine strižibube (*Oberea oculata* L.). **[Swarming, oviposition, and reproductive capacity of *O. oculata*.]** *Zašt. Bilja* No. 57/58, 1960 (115–27 + 8 photos). 10 refs. [Serb. serb.e.*e*.] I.M.I.

The results of a study of this pest of Osiers in Serbia and Macedonia in 1958–59.

4837. Kuteev, F. S. Ol′hovyj skrytnohobotnik —opasnyj vreditel′ topolja. **[*Cryptorrhynchus lapathi*—a dangerous pest of Poplar.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (5–18). 6 refs. [Russ.]

Investigations in the Krasnodar region on the beetle's biology and ecology showed that *Populus* × *canadensis* is seriously attacked, *P. simonii* less so, and *P. alba*, *P. balsamifera* and *P. nigra* var. *italica* very little. Tabulated data are given on the effect of attack on d.b.h. increment (which can fall to 19% of that of healthy trees), and on the effect of BHC and DDT dusts and emulsions on the pest in 1956–58. These reduced but did not eliminate attack. BHC was better than DDT, especially emulsions of ≮6% against adults, and of 8% against youngest larvae.

4838. Nelson, J. C., and Drooz, A. T. **Pales weevil [*Hylobius pales*] control with sodium arsenite.** *J. For.* 59 (2), 1961 (121, 124). 5 refs.

'Atlas D' Na arsenite barking compound was applied at time of cutting to Scots Pine Christmas tree stumps (2–3 in. diam. 3 in. above ground) at a rate of ½ oz./stump. This prevented establishment of *H. pales*: none of 22 stumps examined a year later were infested, while all of 22 untreated stumps showed weevil activity. Other animals and fungi found in the stumps are given. The compound contains 40% Na arsenite, animal repellent, wetting agent, and a dark dye.

4839. Sullivan, C. R. **The effect of physical factors on the activity and development of adults and larvae of the White Pine weevil, *Pissodes strobi* (Peck).** *Repr.* from *Canad. Ent.* 92 (10), 1960 (732–45). 11 refs.

Investigations were made, in field conditions, on the influence of weather upon *P. strobi.* In spring populations, maximum activity of adults occurs on relatively clear, warm days, when bark temperatures rise to 26–31° C. and relative humidities (r.h.) remain low. At lower temperatures, activity decreases, but remains fairly constant over the greater part of the normal range of r.h. At bark temperatures higher than the optimum, activity drops rapidly and is nil at 35° and above. The lower bark temperature limit is 8°. Maximum oviposition occurs at leader bark temperatures of 25–29° with r.h. at 20–55%. At lower temperatures and high r.h., oviposition is reduced much more sharply than feeding and copulation. In autumn, no well-defined feeding pattern is found, but adults prefer the leader and exposed parts of the laterals of the upper 3 whorls when weather permits. The amount of feeding is affected more by temperature than by changes in atmospheric moisture and solar radiation. The rate of feeding of larvae is related to bark temperature. At higher temperatures more food is consumed and the larvae move more rapidly down the stem. The survival of individual populations of *P. strobi* depends not only upon temperature, but also upon their size and distribution within individual stems.

4840. Schwerdtfeger, F. Holzbrütende Scolytidae und Platypodidae (Col.) an *Pinus*-Arten in Mittelamerika. **[Wood-breeding scolytids and platypodids on Pines in Central America.]** *Z. angew. Ent.* 46 (3), 1960 (254–9). 8 refs. [G.g.e.] O.H.

Describes bionomics, hosts, distribution, and economic importance of *Gnathotrichus sulcatus*, *Xyleborus scopulorum*, *X. mascarensis*, *Platypus quadridens* and *P. tremiferus.* All were secondary pests, but *G. sulcatus* caused serious damage to wood, and sapstain.

4841. ŽIVOJINOVIĆ, S. Prilog poznavanju potkornjaka (Scolytidae) munike (*Pinus heldreichii* Christ.) i molike (*Pinus peuce* Griesbach) u Srbiji. **[Scolytidae on *P. heldreichii* and *P. peuce* in Serbia.]** *Zašt. Bilja* No. 57/58, 1960 (21–9 + 5 photos). 13 refs. [Serb.e.] I.M.I.

Lists, with notes, 12 species of Scolytidae taken from (*a*) *P. heldreichii* and 11 from (*b*) *P. peuce* in the Prokletije mountains, Serbia, in 1958–59. A number of species were recorded for the first time from both (*a*) and (*b*). The most numerous species on (*a*) were *Pityogenes chalcographus*, *P. trepanatus*, *P. quadridens* and *Ips typographus*; and on (*b*) *P. chalcographus*, *Pityophthorus lichtensteini*, *I. sexdentatus*, and *I. amitinus*. Eight species were common to both Pines.

4842. MEL′NIKOVA, N. I. Biologija i ėkologija koroedov tipografa, dvojnika i gravera v Podmoskovnyh lesah. **[Biology and ecology of *Ips typographus*, *I. duplicatus* and *Pityogenes chalcographus* in the forests near Moscow.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (19–45). 15 refs. [Russ.]

Discusses: flight; development and the number of generations p.a.; length of egg galleries and number of eggs; ecology; the parts of Spruce infested; overwintering; and their status as primary or secondary pests.

4843. ANDREEVA, G. I., and GORJAČEVA, V. I. Primenenie himičeskoj obrabotki drevesiny vzamen okorki. **[The use of chemical methods instead of barking [to control barkbeetles].]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (102–7). 6 refs. [Russ.]

Examines the effectiveness and economics of controlling barkbeetles (*Myelophilus* spp., *Ips* spp., and *Pityogenes* spp.) on Scots Pine and Norway Spruce with BHC, using 5% mineral-oil emulsions and 1–4% solutions in diesel oil (all at 0·3–0·5 litres/sq. m.), as compared with barking. The chemical method is preferred.

4844. VALENTA, V. T. O primenenii koncentratov mineral′no-masljanyh ėmul′sij na lovčih derev′jah dlja bor′by s bol′šim sosnovym luboedom. **[The use of concentrates of mineral-oil emulsions on trap trees for *Myelophilus piniperda*.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (116–31). [Russ.]

Mineral-oil emulsions of BHC (2, 3, and 5%), of DDT (2, 3, and 5%), and of BHC + DDT (2 + 1%; and 1 + 1%) were used to spray felled trap trees in mature Scots Pine forest. BHC proved much more effective than DDT. Spraying should be done before flight begins; trees under the canopy should be sprayed with 3%, and those in the open with 5%, BHC, one spray sufficing.

4845. MICHALSKI, J., and WITKOWSKI, Z. Dalsze obserwacje nad szkodliwością żeru uzupełniającego i regeneracyjnego *Blastophagus piniperda* L. (Coleoptera, Scolytidae) w drzewostanie sosnowym I klasy wieku. **[Further observations on feeding damage of *Myelophilus piniperda* in age-class I Pine stands.]** *Sylwan* 104 (12), 1960 (21–32). 18 refs. [Pol.russ.e.]

Reports observations over a further 3-year period (1956–58), which show that diam., height and volume increment were reduced by 36·1, 22·4 and 41·0% respectively. [Cf. *F.A.* 20 No. 4920.]

4846. KNIGHT, F. B. **Variations in the life history of the Engelmann Spruce beetle.** *Ann. Ent. Soc. Amer.* 54 (2), 1961 (209–14). 2 refs. O.R.S.

A study in Colorado showed that the 2-year life cycle of *Dendroctonus engelmanni* applies to both endemic and epidemic infestations. The life cycle may, however, vary considerably from year to year as climate differs. The % of adults that emerge and hibernate at the base of the trees is extremely variable. Beetles developing in felled trap trees in shaded sites may have a longer cycle than those developing in standing trees near by.

4847. HOLT, W. R. ***Metarrhizium anisopliae* (Metchnikoff) Sorokin infecting larvae of the black turpentine beetle.** *J. Insect Path., New York* 3 (1), 1961 (93). O.R.S.

Full-grown larvae of *Dendroctonus terebrans*, their bodies covered with a white, cottony fungus, were found dead in pupal chambers under the bark of a *Pinus taeda* stump in S. Mississippi. Mycelial growth of the fungus, identified as *M. anisopliae*, completely filled the pupal chambers. Ca. ½ the larval brood were infected, but pupae in the same stump were not diseased. Larvae in trees near by were healthy.

4848. ATKINS, M. D. **A study of the flight of the Douglas-Fir beetle *Dendroctonus pseudotsugae* Hopk. (Coleoptera: Scolytidae). II. Flight movements.** *Repr.* from *Canad. Ent.* 92 (12), 1960 (941–54). 26 refs.

Although *D. pseudotsugae* flies for only a few brief periods during its life, these are vital for the extension and location of infestations. Observations are presented on wing-beat frequency (w.b.f.) and wing-beat amplitude, and the effects on them of temperature, relative humidity (r.h.), light intensity, reduced atmospheric pressure, wing-clipping, wing-loading, and fatigue. Of all flight movements, w.b.f. (and consequently velocity) is most affected by environmental factors. Temperature probably has both direct and indirect effects. R.h. influences flight activity probably through its effect on body temperature. A reduction in w.b.f. at high r.h. is probably due to the onset of thermal paralysis. Light effects are probably due more to sensory stimulation than to direct action on the physiology of the flight muscles, and the effects may be reduced after adaptation and sensory equalization have taken place. Fatigue has a direct effect on the flight mechanism. The flight mechanisms studied and flight velocity are probably closely integrated, and velocity is therefore affected by the environmental factors. There must thus be wide seasonal variations in the speed with which beetles can reach new areas. [Cf. *F.A.* 21 No. 2125.]

4849. DYER, E. D. A. **Flight capabilities of ambrosia beetle (*Trypodendron*).** *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (4). 2 refs.

In spring 1960 marked beetles were released in order to determine the distance that *T. lineatum* might fly to attack logs [cf. *F.A.* 22 No. 2725]. The numbers recovered were very small and they had flown only 110 ft. from a release point. In the following autumn, however, a marked, living ♀ was found in a sample of duff collected at a distance of 2½ miles from the release point and at 1200 ft. lower altitude.

4850. **Elm bark beetles [*Scolytus multistriatus* and *Hylurgopinus rufipes*].** *Leafl. U.S. Dep. Agric.* No. 185 (rev.) 1960. pp. 8. Price 5 cents.

4851. AVRAMENKO, A. V. Primenenie geksahlorana v bor′be s serym volosistym hruščom. **[The use of BHC against *Anoxia pilosa*.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (62–81). 11 refs. [Russ.]

Trials have been made since 1956 in the Central Don region with BHC for controlling *A. pilosa* larvae attacking young *Pinus* [*sylvestris*] plantations on sandy soils. Treating the roots with BHC suspensions or dusts before planting (0·4 g./plant) gave good results in terms of seedling growth and survival. Application of 12% BHC dusts to the soil in the planting patches (3 and 9 g./sq. m.) also proved effective, especially in combination with a pre-planting root soak in a BHC suspension. In plantations aged 15–20 years, where larval attack was heavy and some trees had started to die, dusting of the soil with 12% BHC at 10, 25 and 100 kg./ha. and to depths of 20 and 30–40 cm. gave good control in 2–3 years and significantly improved stand condition. In further tests, DDT and BHC dusts and sprays were used as soil surface treatments against the beetles; 12% BHC dust proved the best, but was not completely effective. Control of the beetles is economically possible and practicable only on very badly attacked, small areas, using rates of 25 kg./ha.

4852. SERBSKAJA, L. K. Opytno-proizvodstvennaja bor′ba s majskim hruščom v Buzulukskom boru. **[Experimental large-scale control of *Melolontha melolontha* in the Buzuluk Pine forest.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 43, 1960 (82–101). 19 refs. [Russ.]

Gives an account of various methods of controlling the adult and larval stages of the pest. Against the adults, dusting their main feeding grounds with 12% BHC from the air (at 15 kg./ha.) or from the ground (20 kg./ha.) is recommended; against the larvae, working 12% BHC dust into the soil at 40 kg./ha., a year before planting, or broadcasting it at 40 and 80 kg./ha. immediately before planting; or soaking plant roots in a mixture of 12% BHC dust with humus-rich earth and water (to give each plant 0·5 g. of BHC) before planting.

4853. BEREZINA, V. M. Vlijanie na rost sosny himičeskogo metoda bor′by s žukami majskogo hrušča. **[Effect of chemical control of *Melolontha* sp. on the growth of Scots Pine.]** *Lesn. Ž., Arhangel′sk* 3 (3), 1960 (41–3). [Russ.]

Aerial dusting with 12% BHC and 5·5% DDT dusts (both at 20 kg./ha.) has been carried out on pure plantations of Scots Pine in the Savala forest district, Voronezh region, in several years since 1952. BHC proved far superior to DDT, and complete aerial dusting at 20 kg./ha. is recommended in years of mass cockchafer flight, with aerial or ground control of pest foci in the intervening years.

4854. NIKLAS, O. F. Standortseinflüsse und naturliche Feinde als Begrenzungsfaktoren von *Melolontha*-Larvenpopulationen eines Waldgebietes (Forstamt Lorsch, Hessen) (Coleoptera; Scarabaeidae). **[Site influences and natural enemies as factors of natural control of larval populations of *Melolontha* in a forest area (Lorsch, Hesse).]** *Mitt. Biol. Bundesanst. Land- u. Forstw., Berl.* No. 101, 1960. pp. 60. 104 refs. [G.g.e.*e.*]

Reports on six years of field and laboratory investigation on mixed populations of *Melolontha melolontha* and *M. hippocastani* [cf. *F.A.* 21 No. 781]. *Rickettsia* was the most important mortality factor, followed by nematodes. Wild boars occasionally killed all larvae in a limited area, and crows killed many on upturned soil, making soil cultivation an effective means of control. In continuously infested habitats, clear fellings, open forest margins etc., mortality was ca. 50%, independent of fluctuating densities. Neither soil nor vegetation type appeared to be correlated with population densities or mortality rates.

Hymenoptera

See also Nos. 4030–1, 4774, 4776, 4779, 4788.

4855. PRUJA, J. P. Note sur deux Siricidae des sapinières du Rif occidental. **[Two siricids from the Fir forests of the Western Rif.]** *Bulletin de la Société des Sciences Naturelles et Physiques du Maroc, Rabat* 39 (3/4), 1959 (203–4 + 1 photo). 8 refs. [F.f.e.]

Urocerus augur and *Xeris spectrum* collected from *Abies pinsapo* subsp. *maroccana.*

4856. SCHWENKE, W., and STEGER, O. Über Auftreten und Bekämpfung der Kiefernbuschhornblattwespen in Nordbayern 1959/60. **[The occurrence of Diprionidae in N. Bavaria, 1959/60 and their control.]** *Allg. Forstzeitschr.* 16 (8), 1961 (145–7). 5 refs. [G.]

Discusses the extent of an epidemic, mainly of *Diprion pini*, its causes (probably the 1959 drought) and development, including parasitization. Aerial spraying in June and July with 15 litres/ha. of 5% DDT in diesel oil (0·7 kg. active principle/ha.) at a cost of DM.29/ha. killed 99% of all larvae present, those adults directly hit, and some of the larvae hatching later. Recovery of treated stands was good and prospects for next year fairly so.

4857. VASIĆ, K., and ŽIVOJINOVIĆ, D. Obična borova zolja (*Diprion pini* L.) na Maljenu 1954 i

1955 godine. Životni ciklus, ekologija i populaciona dinamika. [***D. pini*** **on Mt. Maljen in 1954–55. Life cycle, ecology, and population dynamics.**] *Zašt. Bilja* No. 57/58, 1960 (31–71 + 9 photos). 14 refs. [Serb.serb.e.*e*.] I.M.I.

Further data on the outbreak [see *F.A.* 17 Nos. 656–7; 21 No. 4698] from the entomological station established on Mt. Maljen in 1954. The outbreak, lasting from 1950 to 1955, reached its climax in 1954 when it extended over ca. 6000 ha.

4858. NORRIS, D. M., and COPPEL, H. C. **Translocation and stability of Chipman R-6199 in** ***Pinus strobus*** **as related to its control of the introduced Pine sawfly,** ***Diprion similis***. *J. econ. Ent.* 54 (1), 1961 (159–61). 2 refs.

[Cf. *F.A.* 22 No. 2158.] Following stem implantation (aqueous solution in 4 half-inch holes per tree, 6 in. above ground level) of Chipman R-6199 (0,0-diethyl S-(2-diethylamino) ethyl phosphorothiolate-hydrogen oxalate salt) in July 1958, a slow translocation brought the highest concentrations of the salt to the needles of the lower branches by October. By Aug. 1959 mean concentrations in the upper middle and lower crown were virtually equal. The practical control of the sawfly for 2 years and partial control in the third year are explained by the long stability of the salt in the tree. *From authors' summary.*

4859. FINLAYSON, T. **Occurrence of diapause in** ***Aptesis basizona*** **(Grav.) (Hym., Ichneumonidae).** *Ent. mon. Mag.* 96 (1154/1156), 1960 (177).

At temperatures ⩽12° C., maintained during the whole development period, all eggs of this European parasite of *Neodiprion sertifer* cocoons, bred for release in Canada and for experiment, went into diapause for up to a year before emergence; at 20°, none did. If kept at 20° until the spun larval stage, lower temperatures then produced diapause in some and not in others. Diapausal %s were greater on new than on 1- or 2-year-old cocoons of *N. lecontei* at a given temperature.

4860. SMIRNOFF, W. A. **A virus disease of** ***Neodiprion swainei*** **Middleton.** *J. Insect Path., New York* 3 (1), 1961 (29–46). 1 ref. O.R.S.

Reports on laboratory and field studies on the control of *N. swainei* in Quebec. It was found that young larvae infected with nuclear polyhedrosis die more rapidly than older larvae, and total mortality is greater. Disease development is increased at higher temperatures in the laboratory and in parts of the forest with full sunlight. Effective virus concentrations range from 500,000 to 3,000,000 polyhedra/ml. Higher concentrations do not hasten the disease process or increase mortality. Lower concentrations, down to 1000 polyhedra/ml., kill successively smaller %s of infected larvae, in progressively longer periods. Spread of the disease is neither rapid nor extensive, being limited to several hundred yards. This is compensated for by transovarial transmission and movement by wind and predators. Experimental applications of virus suspensions during the egg and early larval stages gave good control of the treated populations, and local spread of the disease in late summer. The disease reappeared the following year in the progeny of larvae that experienced a non-fatal infection. The virus is readily preserved within the polyhedron when present in dried larvae, or in dilute mixtures of dead larvae and water. Short-term storage of the polyhedra in benzene or fuel oil does not reduce pathogenicity of the virus. *From author's summary.*

4861. Erfahrungen mit der kleinen roten Waldameise (*Formica polyctena* bezw. *Formica rufa*) bei der Bekämpfung von Forstschädlingen. Bericht über die Ansiedlungsversuche im FA Cloppenburg. [**Control of forest pests by** ***F. polyctena*** **or** ***F. rufa*****. The Cloppenburg experiment in establishing colonies of ants.**] *Aus dem Walde, Hannover* No. 4, 1960. pp. 98 + 13 photos, 1 map. 39 refs. [G.]

Summarizes, in 7 articles, experience from a study, planned in 1952, on the role of ants in controlling *Pristiphora abietina*, against which chemical control had given merely temporary success. The collapse of the outbreak restricted this study to methods of selecting, establishing and maintaining colonies and watching their effect on low populations of *P. abietina*. Stable colonies have been established at costs considered high but not unjustifiably so. It is thought probable that the ants can prevent outbreaks provided that population increase of the sawfly is not very rapid. [Cf. *F.A.* 19 Nos. 739, 4575; 20 No. 4941.]

4862. RADONJIĆ, S. Pojava smrčeve zolje (*Ligaeonematus abietinum* Hgt) na Kosmaju. [**The occurrence of** ***Pristiphora abietina*** **at Kosmaj.**] *Šumarstvo* 13 (11/12), 1960 (519). [Serb.]

Reports a first attack on 20-year Spruce plantations at Kosmaj in May 1959. Counts in the autumn in the top 4 cm. of soil on 1-sq.-m. quadrats, showing a mean of 41·8 pupae per plot, proved a reliable indicator of the severe attacks that followed in 1960, when 50-year-old trees were also attacked. Notes on biology and life history are given.

4863. NAIRN, L. D. **Relation of stand density to defoliation and growth in Tamarack stands.** *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (3).

Observations made since 1951 on sample plots in a well drained pure *Larix laricina* stand, to determine the effects of thinnings on Larch sawfly infestations, indicate that thinning to 500 stems/acre on a small plot has reduced the severity of attack from Larch sawfly in the initial stages of the current outbreak, and increased tree growth as compared with less severely thinned or unthinned plots.

4864. MARICONI, F. A. M., and CASTRO, U. PAIVA. Novos resultados do combate à saúva com o aldrim en pó. [**New findings in the control of leafcutter ants with aldrin powder.**] *Biológico* 26 (12), 1960 (239–44). 5 refs. [Port.] C.G.B.

Aldrin powder 2·5% was blown into ant-hills of (1) *Atta laevigata* and (2) *A. sexdens rubropilosa*, and the effects were examined after 48, 88 and 176 days. It was found that 20 g./sq. m. gave results as good as 30 g. With one application of the powder to every 5 sq. m. of the infested area, good results were obtained against (1), and poor results against (2). It is possible that, for the latter, one application to every 3, 2 or even 1 sq. m. may be necessary.

4865. HURD, P. D., JR., and MOURE, J. S. **A New-World subgenus of Bamboo-nesting carpenter bees belonging to the genus *Xylocopa* Latreille.** *Ann. Ent. Soc. Amer.* 53 (6), 1960 (809–21). 22 refs. O.R.S.

Proposes a new subgenus, *Stenoxylocopa*, type species *X. artifex*. The nesting habits of *X. nogueirai* sp. nov. (described) and its parasites are reported from nests in the internodal cavities of Bamboo (*Bambusa* sp.) near Cosmópolis, São Paulo, Brazil. A summary of information on nests of other species in the subgenus is given, particularly *X. artifex* in various Bamboos including *Chusquea bambusoidea* and *Arundo donax*. [Cf. *F.A.* 22 No. 1136.]

Diptera

See also No. 4788.

4866. POSTNER, M. Befall der Gallmücke *Agevillea abietis* Hubault (Cecid. Dipt.) an Jung- und Alttannen. **[Infestations by *A. abietis* on young and mature Silver Fir.]** *Z. angew. Ent.* 46 (4), 1960 (379–84). 26 refs. [G.g.e.] O.H.

A. abietis, attacking young Silver Fir in Germany since 1942, is identified with *Diplosis abietis pectinatae*, a pest of mature Silver Fir, of which the adult is not known. Existing differences in gall formation are attributed to differences in the morphology of needles of old trees and of young trees grown in dense shade.

459. Other Animals

See also Nos. 4788, 4794.

4867. WADA, Y. **[On a method of population estimation of a spider mite, *Paratetranychus hondoensis* Ehara, feeding on the Japanese Cedar [*Cryptomeria japonica*], by the aid of "beating".]** *J. Jap. For. Soc.* 40 (7), 1958 (288–92). 6 refs. [Jap.jap.e.*e*.]

Since many sharp taps would be required to dislodge all the insects from a given twig, an equation was derived based on the assumption that the number dislodged by tapping is proportional to that remaining on the twig. Application of the equation to the *P. hondoensis* population of 64 *C. japonica* twigs (15 cm. long) tapped against white paper, indicated very satisfactory results for the first 3 tappings, but when the twigs were tapped >4 times, the proportion of insects dislodged decreased, possibly because the proportion of easily dislodged insects in a twig also decreases with each tap.

4868. KORTH, U. Die Domatienmilben der Gattung *Typhlodromus* und ihr Verhältnis zur Linde. **[*Typhlodromus* spp. and their relationship to Lime.]** *Zoologische Jahrbücher* (*Abteilung für Systematik, Ökologie und Geographie der Tiere*), *Jena* 88 (2), 1960 (135–64). 16 refs. [G.g.] O.R.S.

The domatia on *Tilia cordata* and *T. euchlora* consist of axillary tufts of hairs on the leaves; their high moisture content and their even temperature favour mites of the genus *Typhlodromus*, *T. tiliae*, *T. finlandicus* and *T. tiliarum* being the most frequent on the trees examined. The tufts develop independently of the mites and the mites occur on leaves without domatia. These mites are predators on tetranychids and their larvae live on fungus spores. The morphology and biology of the *Typhlodromus* spp. are described.

46. Damage by Man

See also No. 4405.

4869. SCHOPMEYER, C. S., and MALOY, O. C. **Dry face of naval stores Pines.** *For. Pest Leafl. U.S. For. Serv.* No. 51, 1961. pp. 7. 8 refs.

Describes the condition and its more serious form, pitch-streak, on *Pinus elliottii* and, less frequently, *P. palustris*, and discusses causes (chiefly moisture stress through drought, an inadequate crown, or poor techniques impairing water conduction), prevention and control. Though no fungus has been proved a primary cause, certain species are thought to accelerate extension and aggravate the condition [cf. *F.A.* 9 No. 1203].

4870. KHAN, M. A. W., YADAV, J. S. P., and GUPTA, A. C. **Fir and Spruce mortality at Deoban.** *Indian For.* 87 (1), 1961 (2–9 + 1 dgm.). 9 refs.

Abnormal mortality has occurred in *Abies pindrow* and *Picea morinda*, following heavy felling during 1941–50 in these long overstocked forests. Death is supposed to be due to the adverse effects of sudden exposure, which are increased in this case by the superficial root systems of these species and the low crown ratio due to previous overcrowding.

4871. KASIMOV, V. D. Vlijanie mehanizirovannoj valki i trelevki lesa na sohrannost′ podrosta eli. **[Effect of mechanized felling and skidding on the survival of Norway Spruce understorey.]** *Sborn. Rabot Lesn. Hoz. Vsesojuz. Nauč.-Issled. Inst. Lesovod.* No. 41, 1960 (19–23). [Russ.]

[Cf. *F.A.* 22 No. 333.] Winch-skidding of (*a*) whole trees and (*b*) tree-length logs in the Kostroma region revealed that in summer (*a*) caused more damage to the understorey than did (*b*), but that in winter this difference usually evened out. On areas with >10,000 understorey Spruce per ha., all (*a*) skidding should be done in winter.

4872. SABAN, JA. A. Vlijanie trelevki na sohrannost′ samoseva i podrosta buka pri splošnyh rubkah v Zakarpat′e. **[Effect of skidding on the survival of Beech natural regeneration and advance growth in clear fellings in the Trans-Carpathians [Ukraine].]** *Lesn. Ž., Arhangel′sk* 3 (3), 1960 (30–4). [Russ.]

A brief analysis of the damage caused to natural regeneration and advance growth by various methods of skidding, concluding that skyline extraction is the best, and that shelterwood management should be practised.

48. Injuries Due to Unknown or Complex Causes

4873. **Conifer tumors epidemic in some northern Wyoming stands.** *Extr.* from *Rep. Rocky Mt. For. Range Exp. Sta. 1960*, 1961 (17).

In certain Lodgepole Pine stands, distinctive tumours deform stems and branches of 60–100% of the trees. The swellings vary from the size of a pea to 3 ft. in diameter, and though they cause little mortality, heavily tumoured trees are worthless for lumber, posts, or poles. The cause is unknown. Dwarf-mistletoes and fungi are not associated with the disease, and a genetic basis seems unlikely, since Limber Pine and Subalpine Pine are frequently tumoured when they occur amongst badly infected Lodgepole Pine.

4874. PETRENKO, E. S. "Ved'miny metly" v lentočnyh borah Kazahstana. **[Witches' brooms in the "ribbon-like" Pine forests of Kazakhstan.]** *Bot. Ž.* 45 (10), 1960 (1540–2). 2 refs. [Russ.]

Witches' brooms abound in these forests of *Pinus sylvestris* var. *kulundensis*, especially at stand margins or in opened-out stands >50–60 years old. Out of 46 brooms noted on one journey of two km., 2 were on the tip of the crown, and 4 on the N., 8 on the E., 22 on the S., and 10 on the W. side. Possible causes of the brooms are mentioned.

4875. JACQUIOT, C. Note préliminaire sur une maladie du bois de hêtre dans l'est de la France. **[A disorder of Beech in the East of France.]** *Rev. for. franç.* 13 (3), 1961 (167–70 + 2 plates). 4 refs. [F.]

Describes a disorder observed on a number of Beech trees in the Forest of Épinal. The affected trees had oval scars on their bark, and section of the stems showed that the scars covered fissures in the wood. Examination of an affected stand during the growing season revealed fine vertical fissures, some cm. in length, in the bark of many trees, surrounded by apparently healthy tissues. The fissures offer entry to micro-organisms, which invade an elliptical or circular zone, and this necroses and turns brown while a callus begins to form round its periphery. Further study showed that the fissuring is a phase in a process beginning some years earlier. A cross-section made through the central point of a newly formed fissure in 1960 showed that marked anomaly in wood structure had appeared 6 years earlier in the form of a zone of unorganized parenchymatous tissue affecting ¾ of the 1954 growth ring. Normal wood formation was resumed at the end of that growing season. The rays, however, remained dilated, and increment was less than in neighbouring zones. This slowing down of cambial activity causes a slight depression in the external surface of the wood, which may explain the rupture of the bark. Chemical examination showed a marked difference in (*a*) the wood of the affected region and (*b*) samples taken at the same level from unaffected sections of the stem: alcohol-extractible substances were 2·4% in (*a*) versus 0·75 in (*b*), lignin 31% vs. 26, and ash 1·15% vs. 0·52. Possible causes of the disorder are discussed.

4876. ZYCHA, H. Die kranken Buchen—Ursachen und Folgerungen. **[Beech disease—causes and conclusions.]** *Holz-Zbl.* 86 (146), 1960 (2061–3). 6 refs. [G.]

Discusses observations on bark necrosis and its effect on wood quality. The wide distribution of the disorder in 1960 in W. Germany, following the 1959 drought, supports the theory of its physiological origin. The degree of slimy discharge is not considered an indication of the seriousness of the disease, nor the frequently appearing dark sap stains on cut surfaces an indicator of the extent of wood discoloration. [Cf. *F.A.* 21 No. 2148.]

4877. MALAŠKINA, N. S. Anatomo-morfologičeskoe issledovanie suhoveršinnosti duba letnego (*Quercus robur* L.) v uslovijah Kamyšina. **[Anatomical and morphological investigation on stagheadedness in *Q. robur* in the Kamyshin region.]** *Bjulleten' Moskovskogo Obščestva Ispytatelej Prirody* (*Otd. Biol.*) 63 (3), 1958 (127–34). 6 refs. [Russ.e.] C.G.B.

The studies were made in a 52-year stand, originally of mixed hardwoods, but now consisting almost entirely of Oak suffering from a dieback whose cause is not known. Four different zones are distinguished in a dying tree: (I) the dead top of the stem with its dead branches; (II) branches dead at the top but still living at their bases; (III) branches showing no external sign of dying; (IV) epicormics. Characteristics of the shoots in each zone are discussed: (I) dead tissue; (II) moribund tissue, with premature cork formation and tyloses in the vessels, sharply reduced length and diameter increment, increased accumulation of tannins, no starch grains or Ca oxalate crystals; (III) increased starch accumulation and mass deposition of crystals, diameter increment twice that of (II) but significantly less than that of normal branches, normal cork and tylose development at a later stage; (IV) intermediate in structure between (II) and (III).

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

521. Diameter (Girth) and Sectional Area

See also Nos. 4889, 4898–4901.

4878. IVANJUTA, V. M. Pribor dlja mehaničeskogo opredelenija srednego diametra nasaždenija. **[Device for mechanically determining mean stand diameter.]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (162–4). [Russ.]

Describes and illustrates an automatic counter fitted on a caliper, which gives the mean diameter of a stand, rounded to 2 cm. Tests of the accuracy of the device gave a correlation coefficient of 0·99.

4879. VINCENT, A. J. **A quantitative analysis of buttress dimensions of *Shorea leprosula* Miq. (Meranti Tembaga).** *Malay. Forester* 23 (4), 1960 (288–313).

[Cf. *F.A.* 15 Nos. 3863–4.] Analyses data recorded on field sheets for 2000 felled trees, representing the total population of the species for all sites in virgin lowland Dipterocarp forest in Malaya. It is concluded that, for trees buttressed at heights accessible for direct measurement by a man of medium height, standing on the ground and using a tape, measurements taken round the buttresses cannot be used either to estimate growth of the individual tree or as an independent variable in the construction of volume tables.

4880. THOMSON, G. W., and DEITSCHMAN, G. H. [Compilers]. **Bibliography of world literature on the Bitterlich method of plotless cruising. 1947–1959.** Agricultural and Home Economics Experiment Station, Iowa State University, Ames. 1959. pp. 10. 132 refs.

Contains 118 references, plus a further 14 for the same 12-year period included as a supplement by the compilers in April 1960.

4881. LØKEN, J. Øyet som feilkilde ved bruk av stangrelaskopet. **[The eye as a source of error when using a stick relascope.]** *Norsk Skogbr.* 7 (5), 1961 (174–5). [Nor.]

Demonstrates that a systematic underestimate of b.a. is likely to arise with a simple relascope (in this case consisting of a sighting gap of 1 cm. between two short uprights mounted on a stick 50 cm. long) because the pupil is not a pin-point, and because it is impossible to focus clearly on the sight and the sighted object at the same time. This results in the omission of trees that by reason of their size and distance should be included in the count, but yet appear smaller than the sighting gap. Using a larger gap (2 cm. on a 1-m. stick), working only in good light when the pupils are contracted, and frequent checking by measurement to discover the extent of the "false daylight" between sight and tree, are recommended to reduce the error.

522. Height, Length

4882. KRAMER, H. **The height of the tallest trees as stand characteristic.** *Transl. For. Prod. Lab. Can.* [No. 11, 1960.] pp. 31. 79 refs. Transl. by H. Bernard from *Allg. Forst- u. Jagdztg.* 130 (10), 1959 (241–55). [See *F.A.* 21 No. 2166.]

523. Bark

4883. EH, H. Untersuchungen über die Rindenstärke der Fichte in einigen Wuchsbezirken des württ. Oberschwabens. **[Bark thickness of Spruce in some growth regions of the Württemberg part of Upper Swabia.]** *Allg. Forst- u. Jagdztg.* 132 (4), 1961 (104–9). 5 refs. [G.g.e.]

A study of absolute and relative bark thickness based on 348 dominant stems from 3 representative pure stands aged 60 to 90 years (d.b.h. varying from 10 to 50 cm.). Bark % based on sectional area and diameter decreased up to ¼ of tree height and increased thereafter, and decreased with increasing tree height and d.b.h. Bark volume % first decreased and later increased with increasing height and d.b.h. It was slightly greater than the customary addition of 10% to volume u.b., and greater than in Flury's data used in Grundner and Schwappach's yield tables (1952 edition) [cf. *F.A.* 14 No. 533].

4884. ZAHAROV, V. K. Novoe v metodike opredelenija ob″ema kory drevesnyh stvolov. **[New points on ways of determining bark volume.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (10–4). 4 refs. [Russ.]

Using the linear relationship between bark thickness at any height in the tree and d.b.h., the author presents a table for Oak, Ash, Aspen and Alder showing bark thickness and taper o.b. at decimal sections of total stem height as %s of bark thickness and taper o.b. at 0·1 of stem height; this relationship is also shown in a graph for Ash. Another table and graph show bark thickness of Oak, Ash, Alder and Aspen as a % of stem diameter o.b. for decimal sections of stem height. The volumes of sections u.b. are calculated in %s of total stem volume, and the results tabulated. The relation between d.b.h. and bark % by volume is expressed by the equation: bark % = 22·6−0·12 d.b.h. (for Oak), and bark % = 19·4−0·14 d.b.h. (for Ash). Measurements on 786 Spruce in European Russia have shown that bark % by volume is 7·8 on site class Ia, 9·2 on I, 10·6 on II, 12 on III, 13·4 on IV, and 15·2 on V.

4885. MILIN, Ž. Debljina kore bukve na Južnom Kučaju. **[Bark thickness of Beech in South Kučaj.]** *Šumarstvo* 13 (11/12), 1960 (489–93). 3 refs. [Serb.g.]

Presents a table and graph showing double bark thickness at b.h. by 5-cm. diam. classes (10–95 cm.), prepared, using statistical methods, from measurements of 5142 stems. Expressions and values are also given for the relationship between diam. u.b. and diam. o.b., and for bark as a % of stem diam., volume and increment.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

4886. WUTT, H. Schaftkurven-Näherung durch Interpolations-Polynome. **[Approximation to stem curves by polynomial interpolation.]** *Cbl. ges. Forstw.* 78 (1), 1961 (39–55). 16 refs. [G.g.]

Describes and discusses mathematical formulae for finding the diameter at a given point if others above and below that point are known. As a rule, 4 diameters are required (3 if the top is included). The formulae are considered sufficiently accurate for yield studies, and suitable for a computing machine of moderate capacity, but the formulation of equations for whole stems presents great difficulties. *From author's summary.*

4887. HELLRIGL, B. Il calcolo del coefficiente di forma col metodo relascopico. **[The calculation of form height by the relascope method.]** *Ital. for. mont.* 16 (1), 1961 (40–6). [It.it.f.]

The author develops a formula for calculating form height by the angle-count method and compares it with a similar method suggested by Bitterlich [cf. *F.A.* 20 Nos. 4970–1].

4888. Čuenkov, V. S. Polnodrevesnost′ listvennicy daurskoj v Amurskoj oblasti. **[Taper of *Larix gmelinii* in the Amur region.]** *Lesn. Ž., Arhangel′sk* 3 (4), 1960 (22–5). 5 refs. [Russ.]

From measurements on 200 stems in the Amur region and 100 in the Kamchatka region, from mature stands of 130–170 years and site class III–IV, the diameter-quotient series for each region is determined. The diameter-quotient series are compared with each other and with that of *Pinus sylvestris* from European Russia. The Amur *L. gmelinii* had the greatest taper (presumably because it grows in the permafrost zone). For the same d.b.h. and height, the volume of Amur Larch was 7% less than that of Kamchatka Larch and 15% less than that of Scots Pine. It is concluded that special volume and assortment tables must be made for the Amur region.

524.3. Volume of Tree Groups and Stands

See also No. 4895.

4889. Takata, K. **[Studies of the volume estimate by basal area at breast height. (8). Stand volume estimation by stand volume table.]** *J. Jap. For. Soc.* 40 (7), 1958 (277–87). 2 refs. [Jap.jap.e.]

A continuation of the study on volume estimation, [cf. *F.A.* 22 No. 869] dealing particularly with the errors involved in using the Relascope, Conometer etc.

4890. Loetsch, F. **Report to the Government of Indonesia on the application of mean tree tariffs for the further development of forest management of the plantation forests.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1281, 1960. pp. 114 + 26 pp. of tbls., + 8 figs.

Emphasizes the suitability of the mean-tree tariff [volume table] in the forest inventory of even-aged plantation forests, especially for tropical fast-growing species. Its advantages are simplicity and a sound statistical basis. Following the methods of Krenn in Europe [cf. *F.A.* 13 No. 3203] the author developed tariffs (given in appendices) for the plantation forests of the following fast-growing species of Indonesia: *Pinus merkusii*, *Agathis loranthifolia*, *Acacia decurrens*, *Anthocephalus cadamba*, and *Albizzia falcata*. A special tariff was also constructed for the valuable Teak plantations, in terms not only of volume but of monetary value; and a preliminary mean-culm tariff for the important Bamboo *Gigantochloa apus*.

4891. Berben, J. C. Inhoudstafel voor *Pinus sylvestris* in Limburg. **[Volume table for *P. sylvestris* in Limburg.]** *Agricultura, Louvain* 9 (1), 1961 (125–34 + 2 tbls.). 14 refs. [Du.du.f.e.] C.G.B.

A volume table is presented, based on samples of Scots Pine from 20 different areas of Limburg (N.E. Belgium). The volume of trees of girth ranging from 15 to 90 cm. is calculated from mean g.b.h. or mean d.b.h. of the population and from the corresponding mean height (calculated up to a top diam. of 4 cm.). The general formula is expressed by the exponential function $V = \bar{a}d^{\bar{b}}$, where V = volume, d = diameter, $\bar{a}$ is related to mean diameter and to mean height by a given formula, and $\bar{b} = 2{\cdot}47$. *From author's summary.*

4892. Berben, J. C. Tarif de cubage du pin sylvestre dans le Limbourg. **[Local volume table for *Pinus sylvestris* in Limburg.]** *Bull. Soc. For. Belg.* 68 (3), 1961 (149–76 + 1 tbl.). 14 refs. [F.]

Single-entry tables, based on measurement of 973 trees, for d.b.h. (0·3-cm. intervals) or g.b.h. (1-cm.).

4893. Vincent, A. J. **A commercial general volume table for *Shorea leprosula* Miq. (Meranti Tembaga).** *Malay. Forester* 24 (1), 1961 (50–67). 4 refs.

A commercial general volume table, the first of a series for Malayan tree species reckoned to be of sufficient abundance and economic value and to grow naturally in sufficient purity to warrant individual treatment. Estimated volume is of utilizable bole u.b. to 24-in. girth o.b., in cu. ft., by 3-in. g.b.h. classes, stratified by 5-ft. clear-bole height classes.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 4880–1, 4938, 4944, 5302.

4894. Ćurić, R. Neki taksacioni podaci iz sastojina Pančićeve omorike u okolini Višegrada. **[Enumeration data from *Picea omorika* stands near Višegrad.]** *Šumarstvo* 13 (11/12), 1960 (515–8). [Serb.]

Ecological observations and data from the two largest stands of *P. omorika*, at Veliki Stolac (ca. 30 ha.) and at Gostilja (13 ha.).

4895. Müller, G. Einige Untersuchungen über Variabilitätskoeffizienten, mittleren prozentualen Fehler und Flächenverteilungsreihen in der Forstwirtschaft. **[Studies on the coefficient of variation, the standard error % and area distribution series in forestry.]** *Arch. Forstw.* 9 (12), 1960 (1059–64). 6 refs. [G.g.russ.]

The % error (P) of the ocular cruising practised in Saxony for >100 years in working-plan revisions, is checked from the ratio of actual volumes clear-felled in the previous decade (AV), using the formula $P = (AV{-}EV)/EV$, where EV is the growing stock estimated on the same areas. From studies of such data a formula, $P = p\%/\sqrt{F}$, was derived, which eliminates a constant systematic underestimate and incorporates area (F) and a 5–6% safety factor. In it $p\%$ is the mean error of estimate per ha., the value of which was found to be ca. 20%. With $F = 9$ ha. the error is ca. 7% and at 500 ha. <1%. Consequent on suggestions that the populations concerned should be studied on a basis of relative rather than absolute variation, Pearson's coefficient of variation $V = (S_x \times 100)/\bar{x}$ is considered, together with formulae corresponding with or derivable from it. Of these, the standard error has some advantages over V and both have many advantages over the mean error. Some results are also given, by way of further example, of a study of an area-distribution series (volumes/ha.) and of the accuracy of a rapid method of growing-stock determination in which only every fifth compartment is enumerated. In 5400 ha. with compartments of 15–20 ha. the standard error and coefficient of variation were both ±3·6%.

4896. Vincent, A. J. **A critical review of the sampling practice integrated with present day Malayan silviculture**. *Malay. Forester* 24 (1), 1961 (19–31). 22 refs.

The systematic sampling procedures in virgin and regenerated inland Dipterocarp forest included in the Malayan uniform system are outlined, and their merits and drawbacks discussed.

4897. Mokashi, V. K. **Systematic sampling in timber surveys**. *Indian For.* 87 (3), 1961 (184–8). 13 refs.

Reviews the problem of estimation of error variance of a systematic sample and suggests two alternative designs in which the sample becomes partly random and partly systematic. The first is a modification of the stratified random sampling design, and the second a modified Latin-square restricted-sampling design. The designs require further testing before application. *From author's summary.*

4898. Palley, M. N., and Horwitz, L. G. **Properties of some random and systematic point sampling estimators**. *For. Sci.* 7 (1), 1961 (52–65). 9 refs.

Advances mathematical proof to show lack of bias in the following estimators for total b.a. in random and systematic point sampling and in the corresponding estimates of volume, viz. Bitterlich (g), systematic point sampling (gf), and systematic point sampling with the number of random starts equal to the number of independent systematic sub-samples forming one sample ($\bar{g}$). Shows also that volume estimates based on sampling for b.a. at n points, and sub-sampling for volume at a smaller number of m points out of n, are biased, but the bias is small, given specified relations for b.a. and volume parameters. Expressions for the true variances of g and $\bar{g}$ are derived and unbiased estimates of those and likewise for corresponding variances for volume, are shown to exist. The mean square error of the estimate for volume has been derived and an estimation for this mean is suggested. Conditions under which sub-sampling for volume is advantageous are formulated and a procedure for systematic point sampling based on several random starts and incorporating some of the advantages of both random and systematic sampling is suggested. *From authors' summary.*

4899. Cox, P. **A test of variable plot cruising in mixed stands on Latour State Forest**. *St. For. Note Calif. Div. For.* No. 5, 1961. pp. 6. 9 refs.

Tests on 175 acres of mixed conifers, using prisms of differing basal-area factors, showed that variable-plot cruising resulted in lower sampling errors and permitted striking economies in tree measurements, and therefore time. The application of the method, now in general use in the Latour State Forest, is described, with the results obtained. [Cf. *F.A.* 18 No. 4379.]

4900. Malain, R. J. **A test of variable plot cruising in young growth Redwood**. *St. For. Note Calif. Div. For.* No. 7, 1961. pp. 7. 9 refs.

B.a. and bd. ft. volume results were analysed and compared from 3 cruises in dense stands of *Sequoia sempervirens* and *Pseudotsuga taxifolia*: (*a*) a 10% ⅕-acre plot cruise, and two variable-plot cruises using a Spiegel-Relaskop with b.a. factors of (*b*) 40 and (*c*) 54·44. The most efficient cruise was (*b*); to reach an accuracy of ±10% with this method, 31% fewer trees need be measured than with (*a*).

4901. Ivanjuta, V. M. Metod perečislitel′noj taksacii lesa bez otbivki probnyh ploščadej. [**Method of plotless cruising**.] *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (8–10). [Russ.]

In the method suggested (and tried with satisfactory results in 12 stands, predominantly Pine, Spruce or Birch), an enumeration is made, along a zigzag course in the stand, of a sufficient number of trees [not further specified] to give satisfactory accuracy. Also, the height of 12–25 trees of various d.b.h. is measured for the construction of the height curve, and at three points the b.a./ha. is determined by Bitterlich's method. Division of the b.a./ha. (as found by Bitterlich's method) by the sum of b.a. calculated for the actual number of trees enumerated, gives a conversion coefficient by which the results of the zigzag enumeration should be multiplied to convert them to values per ha. If the undergrowth is too dense to permit use of Bitterlich's method, the following method may be substituted. A clinometer, having an extra scale graduated with the reciprocals of given fractions of 1 ha., is first used as a hypsometer to find mean stand height. The instrument is then set so that the sighting angle shall subtend the mean stand height at a distance equal to the radius of a circle whose area is some predetermined fraction of 1 ha. Sighting at this angle, the observer makes a circular sweep; trees intersecting the line of vision are enumerated and their b.a. converted by formula to b.a./ha. Selection of the appropriate fraction of 1 ha. to be enumerated will depend on the density of the stand.

525. Volume by Assortments. Merchantable Volume

See also Nos. 4322, 4934, 4953, 5097.

4902. Zaharov, V. K., and Sirotkin, Ju. D. Proizvodstvennoe značenie tipov lesa. [**The importance of forest types with regard to production [of wood assortments]**.] *Lesn. Ž., Arhangel′sk* 3 (1), 1960 (5–12). 7 refs. [Russ.]

A study of the industrial wood assortments in various types of mature Belorussian Pine/Spruce stands of the types *Pinetum-piceeto vacciniosum*, *P.-p. polytrichosum*, *P.-p. myrtillosum*, *P.-p. oxalidosum*, mossy Pine/Spruce, and Pine/Spruce with shrubs. The assortment structure of these stand types is tabulated separately, for Pine and Spruce, and it is urged that such studies should form an integral part of forest typological investigations.

526. Log Measurement. Scaling

4903. BUJNJAKOV, A. P. Avtomatičeskoj sčetčik kubatury i količestva breven. **[Automatic log counter and volume indicator.]** *Lesn. Prom.* 1961 (2), (6–8). [Russ.]

The device, the SKB-3, is for automatic measurement and summation of the volume of logs passing along a conveyor. It works on a principle already described [see *F.A.* 20 No. 3565], and is fully described and illustrated. In practical tests (ca. 2500 cu. m. of logs), the error was not greater than ±0·5%, by comparison with volume tables.

4904. NYLINDER, P. Om noggranheten vid mätning med Ava mätställ. **[The accuracy of measurements with the Ava measuring tool.]** *Uppsats. Instn. Virkeslära K. Skogshögsk. Stockh.* No. *R*26, 1959. pp. 11 + [20]. 4 refs. [Sw.sw.e.]

The Ava, consisting essentially of two sighting devices mounted on a light, adjustable tripod, through which diameters and lengths can be read against scales attached to the tripod legs, proved slightly more accurate than calipers in measurements on 3070 pulpwood logs of Pine and Spruce. Volume computed from mid-diameters, measured in ½-in. classes as the logs lay, exceeded the real volume by 1·2% with the Ava and 1·4% with calipers. Volumes tended to be overestimated in diameter classes of >4 in. and underestimated in those of <4 in., for reasons connected with an asymmetrical diameter distribution.

4905. HENLEY, J. W. **Overrun estimates of the Scribner Decimal C log rule and the International ¼-Inch log rule for hardwood logs.** *Rep. U.S. For. Prod. Lab., Madison* No. 2214, 1961. pp. 4 + 68 tbls.

Presents overrun values for these rules, as computed from the mill study data used in *Rep. U.S. For. Prod. Lab.* No. *D*.1737 [see *F.A.* 21 No. 3831]. The overrun values are shown by species, log grade, 1-in. diam. classes, and log soundness.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 4103, 4917, 4928–9, 4941–2.

4906. DISSESCU, R. Variabilitatea proiecţiei orizontale a coroanei şi corelaţia sa cu diametrul de bază la brad. **[Variation in horizontal crown projection and its correlation with d.b.h. in *Abies alba*.]** *Rev. Pădurilor* 75 (4), 1960 (217–21). 7 refs. [Rum.russ.g.f.e.]

From measurements of 304 trees in two even-aged stands aged (*a*) 65 and (*b*) 85 years and an uneven-aged stand (*c*), equations are derived to express the correlation between crown diameter and d.b.h. The value of the ratio for (*a*) was 14·3, for (*b*) 10·3, and for (*c*) 15.

4907. CLARK, F. G. **A hemispherical forest photocanopymeter.** *J. For.* 59 (2), 1961 (103–5). 2 refs.

A wide-angle pinhole camera, facing skyward, developed at the Central Sierra Snow Laboratory, has proved useful for measuring and permanently recording the forest canopy over experimental sites. Construction of the instrument, the photocanopymeter, its calibration, and some uses in analysis of forest cover are outlined.

4908. KRAJICEK, J. E., BRINKMAN, K. A., and GINGRICH, S. F. **Crown competition—a measure of density.** *For. Sci.* 7 (1), 1961 (35–42).

Measurements of several hundred open-grown (*a*) Oak and Hickory and (*b*) Norway Spruce showed high correlations ($r = 0{\cdot}983$ and 0·991 respectively) between crown width (*CW*) and d.b.h. (*D*), independent of age or site. The % of an acre covered by the crown of an open-grown tree is regarded as the maximum crown area (*MCA*) e.g. open-grown Spruce of 16 in. *D* have a mean *CW* of 26 ft., a crown area of 531 sq. ft. and a *MCA* of 1·22%. The sum of the *MCA*'s of a stand divided by its area is the crown competition factor (*CCF*) which is derivable from a stand table and *CW*/*D* regression equations, which for (*a*) above are $CW = 1{\cdot}829D + 3{\cdot}12$, and for (*b*) $CW = 1{\cdot}313D + 5{\cdot}057$. The general *MCA* value is $\pi\ (CW)^2/\frac{4}{435{\cdot}6} = 0{\cdot}0018\ (CW)^2$. For Norway Spruce—squaring *CW* values of (*b*)—the *MCA* is $0{\cdot}0031D^2 + 0{\cdot}0239D + 0{\cdot}0460$. In pure Oak stands, a consistent ceiling density with a *CCF* of 200 was found; a consistent ceiling probably exists for all species. Applications to a stand table of Oak, tests against data for Oaks and Sitka Spruce, and comparisons with other density criteria are discussed. Theoretically the method is applicable to uneven-aged stands. Site and stand age appear definitely not to influence *CCF*. [Cf. *F.A.* 18 No. 3222.]

4909. KEEN, R. E., and WEETMAN, G. F. **Two methods of weighing trees.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 123, 1961. pp. 9. 1 ref.

Describes equipment used, in connexion with a study of nutrient cycles, to weigh small trees and their components in the field, using electrical strain gauges and a strain indicator. Also describes equipment used to weigh pulpwood trees and their components, using a load cell and gauge on a closed hydraulic circuit, and a method of locating the centre of gravity of whole trees and tree-length logs. Both sets of equipment worked well.

54. Assessment of Site Quality

See also Nos. 4174, 4504.

4910. ERTELD, W. Standort und Ertrag im Walde. **[Site and yield in the forest.]** *S. B. Dtsch. Akad. LandwWiss. Berl.* 8 (1), 1959. pp. 35. [G.g. russ.e.]

Discusses, with examples from E. and W. Germany [not always fully quoted], the difference in growth patterns of Spruce and Pine in relation to site, their relation to yield-table values, etc., with special reference to methods used in a study on E. German Pine now in progress. This is largely based on stem analyses of top height and b.a. of mean trees, from which mean height at earlier stages of stand development is computed.

4911. MAGYAR, J. Erdei-, fekete-, luc-, és vörösfenyveseink állagmagassági (termőhelyi) szórásmezeje. **[The range of mean stand height (site index) of Scots and Austrian Pine, Spruce and Larch in Hungary.]** *Erdö* 10 (1), 1961 (11–5 + smries. in suppl.). 5 refs. [Hu.g.russ.]

Site-index data of 6676 subcompartments of Scots and 3784 of Austrian Pine, 2941 of Spruce and 908 of Larch are used to show that the index range is essentially greater than that of Greiner's [1886] tables. The cost of publishing corrected yield tables would be low compared with that involved in continued use of the present tables.

4912. NIKITIN, K. E. K voprosu bonitirovanija nasaždenij. **[The problem of assessing the site quality of stands.]** *Lesn. Ž., Arhangel'sk* 2 (4), 1959 (7–13). 15 refs. [Russ.]

Considers that Orlov's general scale of site classes based on tree height should be supplemented by two similar scales, one for stands where early growth is faster than average, and one for stands where it is slower. Examples of such scales are presented for western and central regions of the U.S.S.R., based largely on studies in the Ukraine in plantations, mainly of Larches, Spruce and Pine, and natural stands of Spruce, Pine and hardwoods.

4913. **Soil and stand factors related to height growth of Lodgepole Pine**. *Extr.* from *Rep. Intermt. For. Range Exp. Sta. 1960*, 1961 (7).

An intensive study of soil and stand factors has made it possible to define more accurately the variables having the greatest influence on height growth of this species. The height of dominant Lodgepole Pine in Montana was found to be highly correlated with a relatively few basic factors: 88% of the variation in height of dominants is accounted for by the equation $Y = 1{\cdot}713976 + 0{\cdot}000024\,X_1 + 0{\cdot}040888\,X_2 - 0{\cdot}508412\,X_3 + 0{\cdot}047573\,X_7$, where Y = logarithm of average dominant height, X_1 = stems/acre, X_2 = average diameter of dominant trees, X_3 = average crown ratio of dominant trees, and X_7 = reciprocal of age upon effective soil profile depth.

4914. DAUBENMIRE, R. **Vegetative indicators of rate of height growth in Ponderosa Pine**. *For. Sci.* 7 (1), 1961 (24–34). 16 refs.

[Cf. *F.A.* 14 No. 1079.] The rate of height growth of 153 stands in E. Washington and N. Idaho showed good correlation with 7 habitat types based on climaxes. The types recognized, with the dominant tree and undergrowth species of the climaxes were: (1)–(4) *Pinus ponderosa/Agropyron*, *–/Purshia*, *–/Symphoricarpus* and *–/Physocarpus* respectively; (5) and (6) *Pseudotsuga taxifolia/Calamagrostis*, and *–/Physocarpus* respectively; (7) *Abies grandis/Pachistima*. Best potentiality was on (7); it was good on (6), (4), (3), fair on (5), and low on (2) and (1). *Arceuthobium* infestation was found only on (2) and (1), where it was common. Regressions of height on age are given for each type. Widely used site-index curves (Meyer 1938) appear not to be valid for the area studied.

4915. STROTHMANN, R. O. **Evaluating the growth potential of Aspen lands in northern Minnesota**. *Sta. Pap. Lake St. For. Exp. Sta.* No. 86, 1960. pp. 20. 4 refs.

Presents a site-prediction scheme and chart based on 4 soil and 3 topographical factors, and requiring only simple field techniques. The soil factors are: % silt-plus-clay and % stoniness in the upper 36 in. of soil; pH of subsoil; and depth to water table (if within 60 in. of soil surface). The topographical factors are steepness of slope, position on the slope, and slope aspect. [Cf. *F.A.* 21 No. 4761.]

4916. WHITTAKER, R. H. **Estimation of net primary production of forest and shrub communities**. *Ecology* 42 (1), 1961 (177–80). 8 refs.

Steps in the approach to such estimation are described: (*a*) field measurement of community production by clipping current twigs and leaves of smaller shrubs, and stand counts of larger shrubs and trees, together with increment boring and height determinations, (*b*) computation, for trees, of estimated volume increment, (*c*) analysis of major species to determine production ratios, and (*d*) estimation of net production by woody plants in the community from the field measurements.

56. Increment. Development and Structure of Stands

See also Nos. 4056, 4289, 4297, 4299, 4314, 4322, 4329, 4332 *et seq.*, 4457, 4485 *et seq.*, 4910, 4913–4, 4916.

4917. MITSCHERLICH, G. Untersuchungen in Plenterwäldern des Schwarzwaldes. **[Investigations in selection forests in the Black Forest.]** *Allg. Forst- u. Jagdztg.* 132 (3–4), 1961 (61–73; 85–95). 29 refs. [G.g.e.]

A detailed analysis of structure and increment in typical farm forests consisting of Spruce and Silver Fir, with some Beech, near Wolfach (*a*), and Freudenstadt (*b*). In (*a*) diameter distribution was nearly "normal", in (*b*) less so, and there were marked fluctuations in stem numbers. Stem numbers in the lower layers, particularly those of Fir, were markedly higher in (*a*) which was fenced, than in (*b*), which was not. Fir appeared to regenerate more abundantly under Spruce, and Spruce under Fir. True form factors varied considerably. Crown projections occupied 1·1 to 1·2 times the ground area, but there was much overlap, and crown density, at 78–81%, was about that of even-aged stands. Younger trees sometimes overtopped their elders. The suppression period could be very long, particularly for Fir, where some trees with d.b.h. 5 cm. were 120 years old, but in trees eventually released its length did not affect later growth. Diameter increment culminated at d.b.h. 50–60 cm., height growth at d.b.h. 30–40 cm. (height range 22–26 m.). While volume increment was greatest in the trees with largest crowns, increment per unit of crown size (projection, surface or volume) was greatest in trees with smaller crowns which had just reached the canopy. For individual trees it was higher on (*b*), which was less dense, but total increment over a ten-year period was greater on (*a*), in connexion with an upward shift of the height curve. Various methods of forecasting increment, applied to the data, resulted in errors of 17 to 21%, attributed largely to the influence of weather.

4918. Rock, D. A. **Growth of planted White and Norway Spruce**. *Fox For. Note* No. 78, 1960. pp. 2. 2 refs.

Data from *Picea glauca* and *P. abies* stands established at the Fox State Forest, New Hampshire, in 1936 and measured in 1960.

4919. Schmitz-Lenders, B. Regeneration im Zuwachs durch Grundwasserabsenkung geschädigter Harffer Pappeln. **[Recovery of increment in "Harff" Poplars injured by a lowering of the water table.]** *Allg. Forst- u. Jagdztg.* 132 (4), 1961 (102–4). 2 refs. [G.e.]

[Cf. *F.A.* 21 No. 839.] Re-examination of the trial plots showed a recovery, particularly in height and volume increment, in the last 3 years, though not quite to the former level, and confirmed the previous yield forecasts.

4920. Davidov, M. V. Issledovanija hoda rosta beloakacievyh nasaždenij južnyh rajonov USSR. **[Investigations on the rate of growth of *Robinia pseudoacacia* stands in the southern Ukraine.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (3–9). 6 refs. [Russ.]

A report on work preliminary to the construction of yield tables. The Ukraine has 6700 ha. of Robinia (64·2% ≤10 years old, 10·4% ≥16 years). Data are tabulated and graphed on the height, diameter, b.a., volume, and form factors of Robinia stands of seed (*s*) and of coppice (*c*) origin. Yields of (*s*) compared very favourably with those of *Alnus glutinosa*. M.a.i. culminated at 22 years in (*c*), and at 27 years in (*s*).

4921. Jarvis, J. M. **Forty-five years growth on the Goulais River watershed**. *Tech. Note For. Br. Can.* No. 84, 1960. pp. 31. 5 refs.

Summarizes the results of surveys made in 1920, 1927, 1945–46 and 1956, and presents an analysis of forest development on this watershed from 1910 to 1956 [see Sisam, *F.A.* 1 p. 86]. The results show that the cut-over areas supported a greater volume of timber (7 softwood and 10 hardwood species) in 1956 than they did before logging, the Spruce and Balsam Fir growing stock increasing by 171% in the softwood type, and by 78% in the mixed stands, from 1920 to 1956. In the upland areas burned over in 1920, regeneration of *Acer rubrum*, *A. saccharum* and *Betula lutea* was good, though these young stands contained many defective stems and needed cleaning. Generally, regeneration was unsatisfactory on the sand and gravel flats, many areas being still unstocked. *Populus tremuloides*, *B. lutea* and *B. papyrifera* were the most abundant species, but were of poor quality. Spruce and Balsam Fir were present as an understorey in some of the Aspen stands, but pure stands of Spruce and Fir were scarce.

4922. Filip, S. M., Marquis, D. A., and Leak, W. B. **Development of old-growth northern hardwoods on Bartlett Experimental Forest—a 22-year record**. *Sta. Pap. Ntheast. For. Exp. Sta.* No. 135, 1960. pp. 7. 2 refs.

Based on records from 50 permanent ¼-acre plots in typical undisturbed northern hardwood forest in New Hampshire. Data on growth, mortality, basal area, species composition, etc., for two periods (1931–39 and 1940–58) are discussed.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 4034, 4171, 4997.

4923. Bawcom, R. H., Hubbell, R. J., and Burns, D. M. **Seasonal diameter growth in trees on Jackson State Forest**. *St. For. Note Calif. Div. For.* No. 6, 1961. pp. 5.

Since failure to adjust the time interval between periodic measurements of trees for seasonal growth can lead to substantial errors in growth calculations in continuous forest inventory, a study was made in 1959 to determine when seasonal diameter growth begins, and what differences exist in growth rate during the growing season. Radial growth at b.h. was measured at fortnightly intervals on 3 plots using Reineke dendrometers. Trees measured were 15 of (*a*) *Pseudotsuga taxifolia*, 12 of (*b*) *Sequoia sempervirens*, and a total of 14 of (*c*) *Tsuga heterophylla*, (*d*) *Pinus muricata*, (*e*) *Abies grandis*, and (*f*) *Lithocarpus densiflorus*. All species began growth in mid-March. The first major growth occurred in the last two weeks of April for (*a*), but not until the following fortnight for (*b*), this being the only statistically significant difference in fortnightly measurements of the two species. The measurements (shown in graphs or diagrams) indicate that for continuous forest inventory purposes, no adjustment for current seasonal growth is required for plots re-measured or established in Oct.–March. A correction factor is, however, necessary for the April–Sept. period, when nearly 90% of radial growth occurred.

4924. Nicholls, J. W. P., and Santer, L. **A new tree-sampling device**. *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 272, 1961 (1–2). 4 refs.

The difficulties met with in using existing machine methods of increment-core sampling, viz. increasing frictional forces due to the inability of the tool to dispose of cutting waste, with subsequent degrade of the specimen through heating and compression, are largely overcome in a new prototype machine in which the principle of the chip-disposal action of the chain-saw type of tool is retained and embodied in a mortising-chain type of tool consisting of the following three main components: (*A*) guide-pin unit; (*B*) mortising unit; (*C*) prime mover. The two guide pins (*D*) carry unit *B*, which is fitted with 8 guide bushes, a selected pair of which is used during any one cut as a slide for *B* on *D*, to register the position of the slots to be cut. Four slots $\frac{5}{16} \times 1\frac{1}{2}$ in. are cut in succession; these then enclose the $\frac{7}{8}$-in. square sample which is separated at the pith end (and the hole plugged) by a method such as that used previously [see *F.A.* 16 No. 3340]. Alignment of *A* with the expected position of the pith is necessary to obtain a sample including every growth ring. The prototype ably demonstrated the merits of this method of sampling; in 10 min. a $\frac{7}{8} \times \frac{7}{8}$ in. sample extending from pith to bark was removed from a tree of 24 in. diam.

4925. Glock, W. S., Studhalter, R. A., and Agerter, S. R. **Classification and multiplicity of growth layers in the branches of trees at the extreme lower forest border**. *Publ. Smithson. Inst.* No. 4421, 1960. pp. 10 + 294 + 36 plates. 33 refs.

A detailed account based on the authors' researches from 1939 to 1950, mainly on *Cupressus* and *Pinus* spp., describing methods of analysis, including absolute dating [cf. *F.A.* 11 Nos. 3241–2]; classification of layers (by extension longitudinally and tangentially, completeness, and type of transition); periodicity and the relation of growth rhythms between trees of a species, branches of a tree, trunk and branches, and diameter and tip growth; and discussing ecological, chronological, and meteorological implications. [Cf. *F.A.* 16 Nos. 3271–2; 17 No. 719.]

4926. Weitland, J. Jahrringchronologische Untersuchungen an Laubbaumarten Norddeutschlands. **[Dendrochronological investigations on deciduous trees in N. Germany.]** *Mitt. Bundesforsch-Anst. Forst- u. Holzw.* No. 48, 1960. pp. ii + 122. 32 refs. [G.g.]

A study on 67 Oaks (*Quercus robur*) from 4 districts in coastal regions of N. Germany, supplemented by studies on Beech, Hornbeam and Ash, indicated that synchronization of ring-width curves over large areas was not possible. For smaller areas, late-wood curves of Oak showed greater consistency than curves of total ring width. Beech curves showed greater consistency than Oak but as Beech had not been used for structural work, they did not help for dating purposes. Growth patterns within a given stand showed greatest similarity between Beech and Hornbeam and least between Hornbeam and Oak, the two latter species fluctuated most in ring width, and Ash least. No clear correlations with climate emerged.

562. Volume Increment

See also No. 4302.

4927. Beers, T. W. **Components of forest growth**. *Proceedings, Forest Management Control Conference, Purdue University, Lafayette* 1960 (34–42). 3 refs.

A discussion of terminology relating to continuous forest inventory, including a re-presentation of H. A. Meyer's definitions [see *F.A.* 15 No. 1628] and formulae for: gross growth of initial volume; gross growth including ingrowth; net growth; net growth of initial volume; net increase.

4928. Cooper, C. F. **Equations for the description of past growth in even-aged stands of Ponderosa Pine [in N. Arizona].** *For. Sci.* 7 (1), 1961 (72–80). 11 refs.

Using d.b.h. data from plots of 30–50 trees in 14 stands dating from 1903, 1909 or 1914, in which past growth was ascertained for every tree from discs or cores, the following equations are investigated:—(1) $w\rho^a = K$, where w is the mean tree weight (or some measure of weight, e.g. basal area), ρ is the stand density, e.g. in number of plants per acre, a is an exponent increasing from 0 at germination to ca. 1 at equilibrium, when w is inversely proportional to stand density, and K is a constant. (2) The competition-density equation, a modification of (1): $\log W = \log K - a \log \rho$. (3) Another form $1/w = A\rho + B$, where A and B are parameters whose values change with time. (4) For field data conforming with (3), the logistic equation, expressing the rate of increase in absolute numbers of a population in unlimited space, $dN/dt = r_m N$, where N is the size of the population at time t, and r_m is a parameter designated as the intrinsic rate of natural increase. In limited space, the equation is (5), $dN/dt = (r_m - cN)N$, where N is the number per unit area, c the constant amount by which r_m is reduced by the addition of one more individual in unit space. Equations (2) and (3), relating mean b.a. to stand density, were found applicable both to present and past stands. Data on mean b.a. at several past ages have also been fitted satisfactorily to the logistic curve by assuming that the intrinsic rate of natural increase is not a constant but varies inversely with time. The measure of population size most closely related to the instantaneous relative rate of growth in these stands was a sum of all diameters per acre rather than b.a./acre. Some fish population equations are suggested as probably suitable for analysis of the growth of forest trees.

4929. Voropanov, P. V. O predloženii prof. N. P. Anučina po opredeleniju tekuščego prirosta nasaždenij. **[N. P. Anučin's proposals for determining the current [volume] increment of stands.]** *Lesn. Hoz.* 13 (12), 1960 (22–5). 2 refs. [Russ.]

A detailed criticism of Anučin's proposed method [see *F.A.* 22 No. 2258], pointing out a systematic error (in the calculation of stand cambial area), a false assumption (that annual diam. increment is the same at all heights in the stem as at b.h.), etc. It is argued that, since Anučin's original basic data were mean values (from yield tables), his conclusions are unsuitable for any individual stand, the error being too great.

566. Yield Tables and Their Construction

4930. Christie, J. M., and Lewis, R. E. A. **Provisional yield tables for *Abies grandis* and *Abies nobilis*.** *For. Rec. For. Comm., Lond.* No. 47, 1961. pp. 48. 26 refs. Price 3*s*.

Gives yield tables, form-height tables, and stand-volume alinement charts for each species, based on measurement of sample plots in England, Scotland, and Wales.

4931. Petrov, S. A. Hod rosta listvennicy sibirskoj v uslovijah Južnogo Altaja. **[The growth of *Larix sibirica* in the S. Altai.]** *Lesn. Hoz.* 12 (12), 1959 (16–8). [Russ.]

Presents a yield table based on data from sample plots in natural Larch stands, for site classes I, II, and III and ages up to 200 (by 20-year gradations). [Cf. *F.A.* 22 No. 304.]

4932. Fligg, D. M. **Empirical yield tables.** *For. Surv. Note B.C. For. Serv.* No. 6, 1960. pp. 13 + 1 map, 170 tbls.

A total of 13,371 samples were used as a basis for these tables, which supersede those presented in the *Continuous Forest Inventory of British Columbia, 1957*, and make use of 16 growth types synthesized from the 42 inventory type groups currently recognized in B.C. For each growth type, 3 site classes are distinguished. The primary factor in type classification is floristic composition.

4933. **Yield and stand tables for plantation Teak (*Tectona grandis* Linn. f.).** *Indian For. Rec.* (*n.s.*) (*Silviculture*) 9 (4), 1959 (151–216 + 7 gphs., 3 photos). Price 12*s.* 6*d.*

The new tables, for the Republic of India only, are based on 123 permanent and 5 temporary sample plots with a stocking of 91–110%, corresponding to C-grade low thinning. For lack of material in the higher age groups, data for greater or lesser stand densities could not be compiled. Four quality classes (against 5 previously) are distinguished. In general, heights, and diameters at a given age, are less for all classes, and m.a.i. for stem timber culminates earlier than shown in the former India and Burma tables [cf. Laurie and Ram, *F.A.* 2 p. 331].

4934. Zaharov, V. K., and Trull′, O. A. Hod rosta i tovarnost′ molodnjakov sosny v tipe lesa sosnjak-brusničnik. **[Yield and assortment structure of young Scots Pine stands in the *Pinetum vacciniosum*.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (3–7). [Russ.russ.]

Compares in tables the yield and assortments at 5, 10, 15 . . . 40 years from stands of (*a*) natural and (*b*) artificial (planting at 1 × 1·5 m.) origin on sod-podzolic soils [in Belorussia]. From the age of 25, there was little difference in the yield and assortment structure of (*a*) and (*b*), but the standing volume of (*a*) was 14–16% greater than that of (*b*) up to 20 years. Small assortments (poles, pitprops, etc.) predominated, and only after 30–35 years were building timber and sawlogs obtained.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See Nos. 4305, 4491.

58. Surveying and Mapping. Aerial Survey

See also Nos. 4252, 4270.

4935. Jelem, H. Über die Standortskartierung der Forstlichen Bundesversuchsanstalt. **[Site mapping at the [Austrian] Federal Forest Research Institute.]** *Allg. Forstztg.* 72 (1/2), 1961 (4–7). 54 refs. [G.]

Summarizes the principles on which the official Austrian instructions are based. They aim at producing maps on a scale of 1 : 10,000, based on local surveys combining plant-sociological with pedological methods, supplemented by sample relascope surveys of the stands; classification is by position and geology, natural tree species, soil, and water régime.

4936. Müller, G. Um Massstab und Genauigkeit der Forstgrundkarten. **[On the scale and accuracy of forest estate maps.]** *Arch. Forstw.* 10 (1), 1961 (84–93). 16 refs. [G.g.russ.e.]

Official management procedure (1953) for E. Germany lays down scales of 1 : 10,000 for district and 1 : 5000 for area and boundary maps, though topographic sheets on the latter scale cover as yet only the industrialized areas. Scales used for forest maps in neighbouring countries and for other land use are discussed. Calculations of area, and consequent growing-stock-volume error are presented to show the definite superiority of the 1 : 5000 over the 1 : 10,000 scale. The latter is also inferior for mapping the more complicated detail associated with private and farm forests etc. It has the advantages of matching the general topographic scale and leading to economies in aerial photography and mapping. Topographic sheets of 1 : 2000 are under consideration for all E. Germany. Forest maps of 1 : 5000, reduced from these, may provide a suitable solution.

4937. Sanktjohanser, L. Forstliche Luftbildmessung im Hochgebirge. **[Forestry measurements from aerial photographs in mountains.]** *Mitt. StForstverw. Bayerns* No. 31, 1960 (208–13). [G.]

Briefly discusses the problem of distortion in aerial photographs of mountain country, and describes work with the "Zeiss Stereotop" for mapping and measuring, which is estimated to be ca. 10 times as fast as ground surveying.

4938. Fotogrametría aplicada a la formulación de inventarios forestales. **[Photogrammetry for forest inventory.]** Comisión Forestal del Estado de Michoacán. 1959. pp. 108 + 4 photos, 1 map. 5 refs. [Span.]

A detailed exposition, drawing on local photographs and enumerations, and comprising the following papers: Some principles of photogrammetry applied to inventory (*A. Escárpita Herrera*); Field data for calculating growing stock (*N. Sánchez Mejorada*); Photogrammetric directional triangulation for mapping (*a*) and "intentional sampling" for inventory (*b*) (*R. Rodríguez Caballero*, and *R. Mendoza Medina*) [(*a*) describes a trued-up frame based on quadrilaterals and their diagonals which join up the principal points in overlaps of photo-pairs in the flight direction and in contiguous laterally overlapping pairs; (*b*) involves the delineation on photographs of areas of similar crown cover % and strip enumeration of ≮2% of each].

4939. BERNSTEIN, D. A. **A parallax-factor alignment chart.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 183, 1960. pp. 4. 1 ref.

Presents an alignment chart permitting rapid solution of the parallax formula used to translate parallax differences into elevation differences in measurements on aerial photographs. The chart is used in conjunction with instruments such as the parallax bar or parallax wedge [cf. *F.A.* 20 No. 2188].

4940. MEYER, M. P. **Measurement of crab and flight line overlap in aerial photos.** *Minn. For. Note* No. 103, 1961. pp. 2.

Illustrates and describes the use of a scale designed to facilitate the checking of endlap, sidelap, crab, and departure from the planned flight line on individual flight lines of aerial photographs fastened together in overlap position.

4941. STELLINGWERF, D. A. **Methods and results of a forestry photo-interpretation.** *Publ. Int. Training Cent. Aerial Surv., Delft* No. 8*B*, 1960. pp. 11 + 2 maps.

Existing aerial photographs (scale 1 : 20,000) of an area in Switzerland were studied by interpreters with no knowledge of the forest conditions involved, and distribution of species, age, crown density and forest boundaries were determined. Results were compared with those from field studies. Determination of species proved the most difficult, results being best with Spruce; %s of Spruce and Fir tended to be underestimated and those of broadleaved species to be overestimated. Good results were obtained for age determination of Spruce, and inferior ones for the other species; age tended to be over- rather than underestimated. Results for crown density were good, with a tendency to overestimate the openness of a stand.

4942. Luchtfotointerpretatie. **[Interpretation of aerial photographs.]** *Extr.* from *Jversl. Landsbosbeh., Paramaribo* 1959 (15–8, ii + 2 photos, 1 gph., 2 tbls.). [Du.e.]

In the southern part of the Baboen (*Virola surinamensis*) area No. 5, east of the Tibiti river, a map has been prepared from aerial photographs on which all Baboen trees of crown diam. >7 m. (11,290 trees) have been plotted; density of merchantable trees proved to be ca. 1 per ha. In flowering stands of *Triplaris surinamensis*, it proved possible to identify individually all trees of d.b.h. >10 cm., on 1 : 10,000 aerial photographs. Preliminary studies of stands of *Pterocarpus officinalis* in the swamps of the coastal plain, from 1 : 20,000 aerial photographs, showed a mean volume of 26·7 cu. m./ha.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See also Nos. 4291, 5215, 5291.

4943. Algunas prácticas de ordenación de montes. **[Some practices in forest management.]** Comisión Forestal del Estado de Michoacán. 1960. pp. 96 + 6 tbls. 9 refs. [Span.span.]

Contains the following two papers: The Mexican system of forest management (*R. Rodríguez Caballero*, *R. Mendoza Medina* and *R. Barrena Guerrero*) [its application to local conifer forests is argued mainly from Pearson's "Management of Ponderosa Pine in the South-West" [see *F.A.* 12 No. 2823] and from 9 local examples. The sustained-yield calculation is based on current volume increment (Pressler borings) and reckoned at compound interest. The growing stock *ER* is enumerated before logging, and the volume removed, *VC*, depends on the state of the stands and their improvement. It is distributed over a felling cycle, *CC*, according to the formula $CC = (\log ER - \log VP)/\log 1{\cdot}0p$, where VP = vol. of residual stand in cu. m., and p = c.a.i. %. The forest is divided into equiproductive coupes, for which a felling plan is made.] The combined exploitation of timber and resin (*D. Bello Méndez*, *R. García Maldonado*, and *F. Carreón Reyes*) [considers a plan for incorporating sustained resin production into the system outlined above].

4944. PUTNAM, J. A., FURNIVAL, G. M., and MCKNIGHT, J. S. **Management and inventory of southern hardwoods.** *Agric. Handb. U.S. Dep. Agric.* No. 181, 1960. pp. 102. 77 refs. Price 55 cents.

Brings together the available information on the nature and management of the hardwood forests in bottomlands, swamps, and uplands of the southern U.S.A. (but not the mountain hardwoods).

62. Methods of Management. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 4286, 4293, 4943.

4945. BENINDE, R. M. Die Forsteinrichtungsanweisung (FA 59) für die öffentlichen Waldungen in den Regierungsbezirken Koblenz, Trier, Montabaur und Rheinhessen. **[Instructions for working plans for forests in public ownership in the administrative districts of Koblenz, Trier, Montabaur and Rhenish Hesse.]** *Allg. Forstzeitschr.* 16 (15), 1961 (246–50). 8 refs. [G.]

A brief discussion of the principles underlying the plans, which will be rigidly binding in State forests. Considerable conversion of Oak and overmature Beech is envisaged. [Cf. *F.A.* 22 No. 913.]

4946. DIETERICH, V. Missstimmigkeiten forstlicher Planung und Wirtschaftsrechnung. **[Clashes between forestry planning and economic calculations.]** *Forstwiss. Cbl.* 80 (1/2), 1961 (1–17). 11 refs. [G.g.]

Warns against weakening sound forestry and management principles by economic considerations, discussing *inter alia* the limits of permissible deviations, in time and space, from the prescribed annual cuts, the permissible influence of market trends on choice of species, and questions of forest valuation.

4947. MEHIĆ, M. Primjena maksimalnog intenziteta sječe u sastojinama nepravilnog prebornog tipa planinske bukve. **[Application of maximum intensity of cut in stands of irregular-selection-forest type of mountain Beech.]** *Šumarstvo* 13 (11/12), 1960 (483–8). [Serb.g.]

Stresses the dependence of yield on biological conditions and favourable size-class structure. An analysis of the diameter-class composition of Beech stands in two mountainous areas in Serbia, and the results of subsequent fellings to improve the balance, are used to illustrate the general comments.

4948. HENNE, A. Die Lochkarte in der Kontrollbuchführung. **[Punched cards in management control records.]** *Allg. Forstzeitschr.* 16 (17), 1961 (274–7). 1 ref. [G.]

Describes a system in use in Hesse, combining punched cards prepared in connexion with working plans with cards used in cost accounting of logging operations, supplementing the latter with data on age class, nature of felling (intermediate, final, anticipatory) etc.

64. Forestry as a Business: General

See No. 5311.

65. Special Business Problems of Timber-Growing

See also Nos. 4288–9, 4299, 4433, 4484, 4488, 4491, 4511, 4516, 4536, 4946, 5295, 5317.

4949. OLIVEIRA, J. FILIPE DE. Subsídio para a determinação da explorabilidade financeira do pinheiro bravo. **[Aid in determining the financial rotation of *Pinus pinaster*.]** *Agros* 43 (5), 1960 (333–43). 6 refs. [Port.port.f.e.]

Using a corrected version of Faustmann's formula for the calculation of soil expectation values, a comparison is made of the results obtained by this method (1) and those obtained by (2) calculating the rotation of the highest net yield. The superiority of (1) is demonstrated in that by this means it is possible to calculate the maximum profit obtainable while extending the rotation.

4950. PIŠKORIĆ, O. Duglazija kao vrsta ekonomskih sastojina na degradiranom dijelu krša. **[Douglas Fir as one of the species forming productive stands in the degraded part of the Karst region.]** *Šum. List* 84 (11/12), 1960 (383–92). 6 refs. [Croat. e.]

Presents data on dimensions and increment of stands of (*a*) *Pseudotsuga taxifolia*, (*b*) *Abies vilmorinii*, and (*c*) *Cedrus deodara*, established since 1900 at Rovinj, on the Istra peninsula. It was calculated that for (*a*) and (*c*) costs (planting and tending, with interest of 2% on capital invested) would be recouped from thinnings in 40 years; (*b*) would be less profitable.

4951. KOEBELÉ, F. Indemnités dues aux propriétaires forestiers dépossédés pour construction d'ouvrages d'utilité publique. Cas de peuplements reguliers. Justification de l'emploi d'une méthode de calcul simplifiée. **[Indemnification of forest owners dispossessed for the construction of public utility works. The case of uniform stands. Justification for the employment of a simplified method of calculation.]** *Rev. for. franç.* 13 (4), 1961 (264–73 + 1 gph.). [F.]

The simplification consists mainly in neglecting fellings and compensating for this by assuming a very low rate of interest (2%).

4952. LEROY, R. Lignes électriques et fonctionnement des capitaux dans les peupleraies. **[Electric transmission lines and the capital invested in Poplar plantations.]** *Rev. for. franç.* 13 (5), 1961 (317–31). 4 refs. [F.]

The author puts forward a new method of valuation for compensation in respect of transmission-line rights of way in Poplar plantations, taking into account the ways in which such plantations differ from forest, e.g. their exceptionally rapid growth and inability to regenerate naturally, the relative ease of estimating the value of the soil, and the concept of a risk diminishing progressively as the time of harvest approaches.

66. Costing of Logging Operations

See also Nos. 4571, 4601, 4603, 4606, 4959.

4953. SMITH, G. W., and HARRELL, C. **Linear programming in log production.** *For. Prod. J.* 11 (1), 1961 (8–11). 6 refs.

An example of computing, on a 650 IBM computer, the method of cutting logs from a given stand so as to yield the highest profit, taking into account the prices of sawtimber and pulpwood, the costs of various operations, particularly cross-cutting, involved in the conversion for each diameter class, and finally the limitations of the market, postulating certain relations between the quantities of the various log lengths offered.

4954. ROSE, L. B. **Appraisal of long distance truck hauling.** *Pulp Paper Mag. Can.* 62 (2), 1961 (105–6). 6 refs.

Discusses briefly the main factors that should be considered in estimating the probable cost of a long-distance truck haul for pulpwood.

67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See also Nos. 4948, 4960.

4955. MØLLER, C. M. Perfektionisme og produktionsøkonomi i skovbruget. **[Perfectionism and economic production in forestry.]** *Dansk Skovforen. Tidsskr.* 46 (2), 1961 (53–73). [Dan.]

Discusses, with examples, a widespread tendency to spend, for reasons of prestige or "perfectionism", more than is justified economically, on plantations, tending, roads, draining, inventory and survey, book-keeping, etc. It is claimed that in Danish forestry mechanization has intensified but not cheapened operations.

4956. STREYFFERT, T. **Investments in forestry with reference to reforestation.** University of

British Columbia, Vancouver. 1960. pp. 3 + 12. (H. R. MacMillan Lectureship Address, 1960.)

Discusses particularly conditions in Sweden, and their relevance to those in British Columbia.

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration

4957. RUPF, H. Ein Beitrag zur Frage der zweckmässigen Forstverwaltungsorganisation, dargestellt am Beispiel Baden-Württemberg. **[The organization of forest administration in Baden-Württemberg, as an illustration of an efficient organization.]** *Schweiz. Z. Forstw.* 112 (2), 1961 (95–106). [G.f.]

A detailed description of its structure, tasks (management of state forest plus advice for and administration of the rest), personnel etc., including training of various grades, their responsibilities, etc.

684. Labour Management

4958. RICKES, [G.] Ungelöste Probleme und Zukunftsaufgaben der Waldarbeit. **[Problems and future tasks of forest work.]** *Allg. Forstzeitschr.* 16 (11), 1961 (199–201). 5 refs. [G.]

Discusses the merits in W. Germany of employing independent workers or small contractors with 3 or 4 men instead of, or alongside, permanent staff. Partly because of a rigid wage structure badly adapted to mechanization, the ablest men often prefer to work on their own or for small employers and, because of differences in overheads, social payments, etc., frequently do the work more cheaply, yet earn more, than workers on the payroll. They should be encouraged, to keep them in the industry.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

4959. **[Methods of improving access to forests.]** *Schweiz. Z. Forstw.* 112 (3), 1961 (187–234). [G.f. or F.g.]

A special number, comprising articles on: Access and silviculture (*H. Leibundgut*) [stressing the importance of roads (and uselessness of cableways) for good silviculture and management]; Technical development and forest transport systems (*B. Baldasarjanz*) [how siting of roads is affected by cableways, their width by the building equipment used, etc.]; Computing the profitability of investments in forest transport systems (*H. Tromp* and *F. Wiedmer*) [including a computation in respect of an actual road system of 5 km., costing Swiss Fr.153,000]; and Efficient cable operations (*H. Steinlin* [discussing the relative merits of cableways and roads under various conditions].

4960. **Federal [Canadian] Government's aid to provinces in road building programs affecting forestry operations.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 2038 (*B*-8-*b*), 1961. pp. 7.

An excerpt from *Financial Post, Toronto* 26 March, 1960.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

See also Nos. 5291, 5299.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also No. 5300.

4961. **Yearbook of forest product statistics 1960.** FAO, Rome. 1960. pp. xl + 160. [E.F.Span.] Price $2.50.

4962. KMONITZEK. Der Rhythmus des Holzeinschlags und Holzverkaufs. **[Fluctuations in fellings and sales of wood.]** *Holz-Zbl.* 87 (51), 1961 (757–9). 4 refs. [G.]

An analysis of W. German statistics for 1954 to 1960, indicating that the traditional annual pattern of fellings and sales was little affected by labour shortage or mechanization, and that annual supplies of various assortments were not greatly affected by market fluctuations. Those of conifer wood continued to rise even when prices fell.

4963. GRAINGER, M. B. **The future demand for forest products in New Zealand.** *N.Z. Timb. J.* 7 (7), 1961 (44–9).

Stated in equivalent log volume (in millions of cu. ft.) the total demand in 1957 for sawn wood, pulp products, plywood and veneers, and roundwood was 106, 26, 2, and 4 respectively, the corresponding estimates for the year 2000 being 170, 76, 5 and 7. Imports in 1957 of sawn wood, pulp products, and poles and piles were 6, 11, and 1, estimates for the year 2000 being 5, 8, and 1. Similarly, salvage in slabwood and waste paper in the years 1957 and 2000 are 5 and 1 vs. 14 and 10. Finally the net local wood demand, the suggested provision for export, and the total demand, for the years 1957 and 2000 are 114, 23 and 137, and 220, 150 and 370. These estimates are based on *per capita* consumption, expected population increases, necessity to export for balance of trade, and trends in consumption. The last 40-year estimate, that of 1925 (on which the planting policy was based), is proving remarkably accurate. The new estimate runs to the year 2100 in 25-year intervals.

4964. AUBRÉVILLE, A. Le potentiel des forêts tropicales dans l'économie mondiale du bois d'oeuvre (feuillus). **[The tropical forest's hardwood timber potential in world economy.]** *Bois For. Trop.* No. 76, 1961 (3–13). [F.e.]

4965. BURGOS, B. La mimosa contra el quebracho. **[Wattle vs. Quebracho.]** *Bol. argent. for.* 18 (189), 1960 (6). [Span.]

World consumption of Quebracho, Wattle and Chestnut tanstuffs is ca. 400,000 tons. In this trade, between 1953 and 1959, Quebracho exports fell from 180,000 tons to 100,000 while Wattle rose from 80,000 to 160,000, Chestnut remaining constant. Quebracho reserves are ca. 120 million tons, and with production cost at $148/ton and export price at $160 it can maintain its competitive advantage but suffers penal taxation, viz. an 8% sales tax and 20% *ad valorem* export duty. Bank support is inadequate. The price of Wattle is $152.4/ton but with only 60% tannin content against 64 for Quebracho, its tannin-based price is $162.55. Wattle benefits from a freight rebate of 50%, a 10% English duty against Quebracho and bank credits for export. The largest Quebracho company [Forestal] has removed its installations to Africa and the Wattle trade.

73. Prices

See also Nos. 5206, 5295.

4966. MANTEL, K. Entwicklung und Auswirkung des Holzpreises. **[The development of timber prices and their effect.]** *Holz-Zbl.* 86 (100–104), 1960 (1387–8; 1409–10; 1417–18, 1421; 1425–7; 1441–2). [G.]

A study in five parts: (1) Wood supply in the Common Market is adequate; (2) The effect of demand on price; (3) The price of wood in the play of supply and demand; (4) The effect of price on supply and demand; (5) The effect of transport costs on price.

4967. KRAEGEN, F. F. **Orderly marketing.** *Aust. Timb. J.* 26 (11), 1960 (87 . . . 93).

The area within a radius of 100 miles from Newcastle, N.S.W., lies astride the path of major supplies of indigenous timber to the very large international timber market of Sydney. To by-pass the Newcastle area, supplies for Sydney from the north enjoy royalty and price adjustments. When local supplies exceed demand at Newcastle, or supplies from all sources exceed demand in Sydney, the Newcastle area is subjected to pressures that cause prices to drop below production costs. To meet this situation a combination of local sawmillers and merchants, each relying on their own association to indicate respectively the wholesale and retail price levels, delegate to a combined committee the task of recommending actual prices, any change in which is confirmed by an extraordinary general meeting of the combination. The combination is a non-profit company limited by guarantee (£100 per 250,000 [super?] ft., produced or sold). It is claimed that the scheme is highly successful in stabilizing prices.

74. Trade Policy

See Nos. 4967, 5311.

75. Trade Customs and Usages

See No. 5311.

79. Economics of the Forest Products Industries

See also Nos. 5213, 5215–6, 5294, 5296, 5311.

4968. **The Report on the Census of production for 1954. Volume 10: Industry A: Timber.** Her Majesty's Stationery Office, London. 1958. pp. [12].

Covers establishments engaged wholly or mainly in sawmilling and the manufacture of more finished timber goods (except furniture, wooden containers, and shop and office fittings) and of cork products, and includes figures on gross and net output, employment, wages and salaries, size, specialization, principal products, etc. [Cf. *F.A.* 14 No. 2565.]

4969. MALCOLM, F. B. **Factors influencing an expanded sawmilling industry for Hawaii.** *Rep. U.S. For. Prod. Lab., Madison* No. 2190, 1960. pp. 22 + 10 photos, 3 dgms. 7 refs. P.R.

Examines briefly the present sawmilling facilities in Hawaii and reviews problems connected with future expansion of the Hawaiian timber industry, emphasizing the need to overcome logging problems caused by steep and rugged terrain, high rainfall, silvicultural and management difficulties, labour training, and transport. Details of an initial expanded sawmill programme are given, which will include plans for 2 or 3 fully mechanized mills with annual capacities of 3–6 million bd. ft. of timber, though the density and abrasive characteristics of some woods may well cause problems in sawing and drying. A priority in the general programme will be in marketing—to get local acceptance of home-grown species.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also No. 5294.

4970. **List of publications. January 1 to June 30, 1959.** U.S. Forest Products Laboratory, Madison, Wisconsin. 1959. pp. 13. P.R.

The semi-annual list contains titles under 14 subject sections, papers available for distribution being indicated. It is intended only to supplement the regular subject lists of the laboratory divisions and will eventually become part of the subject lists when they are revised. Full subject lists on each major phase of research are available.

4971. **Industrial progress issue.** *For. Prod. J.* 11 (2), 1961 (49–107). Many refs.

A review for 1960 with many American and other references, including: Logging [see *F.A.* 22 No. 4599]; Lumber manufacturing (*J. K. Barrow*); Wood drying (*E. L. Ellwood*); Wood preservation (*H. E. Troxell*) [including a description of an incising machine for long roundwood]; Glues and gluing (*R. F. Blomquist*); and Chemical conversion (*J. W. Rowe, et al.*). [Cf. *F.A.* 21 No. 3631.]

4972. **[The wood industry in Japan and abroad.]** *Wood Ind., Tokyo* 16 (2), 1961 (1–48). Many refs. [Jap.] P.R.

Contains mainly general articles on various aspects of the Japanese wood industry, and a review of the wood industry in the U.S.S.R. Includes an original research paper by *K. Kitahara* (with English summary and legends), dealing with the problems of pressing particle board at various pressures, temperatures and chip m.c.'s.

4973. **[Veneer, plywood, and fibreboard industries in Japan.]** *Wood Ind., Tokyo* 16 (4), 1961 (1–46). Many refs. [Jap.] P.R.

Mainly general articles (English titles listed), but includes an original research paper by *S. Meiki* (with English summary) dealing with the fireproofing of *Shorea negrosensis* veneers and plywood by immersion in various fire-retardant solutions (fully tabulated data, and including graphs showing absorption curves, etc.).

81. Wood and Bark: Structure and Properties

See also Nos. 4924, 5223.

4974. RICHARDSON, S. D. **A biological basis for sampling in studies of wood properties.** *Tappi* 44 (3), 1961 (170–3). 7 refs. P.R.

Describes patterns of internodal ring width, wood density and tracheid length within single trees. Some variations appear to be inherent and some environmentally determined, and it is argued that, for the successful evaluation of wood properties, the establishment of inherent variation patterns is a prerequisite, and that systematic sampling based on knowledge of these patterns is more appropriate than either random or absolute-height sampling. *From author's summary.*

810. General Information on Woods

See also Nos. 4142, 4154, 5060, 5098.

4975. **Standard nomenclature of the exportable timbers of the Asia-Pacific Region.** FAO, Rome. 1960. pp. 96. 124 refs. Price $1.00 or 5*s*.

A pocket volume containing (1) alphabetical index of botanical names of the exportable timbers in the Asia-Pacific Region (338 spp.) together with average wt. at 15% m.c. and sp. gr., and (2) alphabetical index of the standard export names of timbers within the supplying country. [Cf. *F.A.* 20 No. 3643.]

4976. YOUNGS, R. L. **Physical, mechanical, and other properties of five Hawaiian woods.** *Rep. U.S. For. Prod. Lab., Madison* No. 2191, 1960. pp. 19 + 10 photos, 6 tbls. 15 refs. P.R.

Presents the results of recent evaluations of 5 timber species (*Metrosideros polymorpha, Eucalyptus robusta, Fraxinus uhdei, Cedrela toona* var. *australis*, and *Sequoia sempervirens*) now growing in Hawaii, in an effort to provide a more substantial basis for the development of the Hawaiian wood industry. Comprehensive studies of strength and related properties, and limited exploratory studies of the seasoning, machining, and treating characteristics of the species suggested that, though they should make a considerable contribution to the wood industry and general economy of Hawaii, further research is required in many areas to make possible more efficient utilization of all the timber resources of that State. [Cf. *F.A.* 22 Nos. 947, 2967, 4969.]

4977. **Properties of thinnings of home-grown Lodgepole Pine (*Pinus contorta*). Progress report 2—Consignment 1027.** Forest Products Research Laboratory, Princes Risborough. 1960. pp. 30 + 8 photos.

The second of a series of experiments on *P. contorta* [see *F.A.* 17 No. 1914] in which fifty 28-year trees from Blessington Forest, Republic of Ireland, were submitted to a detailed examination for rate of growth, density, seasoning, preservation, working properties etc. Observations tend to confirm existing knowledge on the species as grown in the U.K., and appear to justify serious consideration of its continued planting.

4978. **World timbers. No. 8. Ash (*Fraxinus excelsior*).** *Suppl.* to *Wood* 26 (4), 1961. pp. 2.

4979. **[Outline of important foreign woods: Apitong (*Dipterocarpus* spp.).]** *Suppl.* to *Wood Ind., Tokyo* 16 (1), 1961. pp. 4. 15 refs. [Jap.] P.R.

Includes photomicrographs and tabulated data on physical and mechanical properties of 11 *Dipterocarpus* spp.

4980. **[Outline of important foreign woods: *Gonystylus* spp.]** *Suppl.* to *Wood Ind., Tokyo* 16 (4), 1961. pp. 4. 7 refs. [Jap.] P.R.

Includes 4 photomicrographs, and tabulated data on physical and mechanical properties, of *G. bancanus* and *G. forbesii.*

4981. **Light Red Seraya (*Shorea waltoni* G. H. Wood (M.S.) and a *Shorea* species of the *S. smithiana* group). Consignment 979.** Forest Products Research Laboratory, Princes Risborough. 1960. pp. 7. P.R.

General description, seasoning, mechanical and wood-bending properties, incidence of insect attack, natural durability, preservative treatment, workability, and veneer and plywood.

4982. ARKWRIGHT, P. **Know your timber. No. 82. Agba [*Gossweilerodendron balsamiferum*].** *Woodwkg. Ind.* 18 (2), 1961 (95). P.R.

4983. KUKACHKA, B. F. **Foreign wood series. Agba. *Gossweilerodendron balsamiferum* (Verm.) Harms.** *Rep. U.S. For. Prod. Lab., Madison* No. 2024 (rev.) 1961. pp. 4 + 2 tbls. 4 refs.

Describes the tree and the wood, with tabulated data on physical and mechanical properties, seasoning, workability, and durability, and details of availability and uses, identification, distribution and habitat.

4984. KOEPPEN, R. C., and KUKACHKA, B. F. **Foreign wood series. Avodire. *Turraeanthus africanus* (Welw. ex. C.D.C.) Pellegr.** *Rep. U.S. For. Prod. Lab., Madison* No. 1905 (rev.) 1961. pp. 5 + 2 tbls. 9 refs.

Gives details of nomenclature, distribution and habitat, and describes the tree, and the wood, with data on physical and mechanical properties, seasoning, working and machining, and veneer characteristics, natural durability, identification, uses, and availability.

4985. SALLENAVE, P. Niangon de Côte-d'Ivoire et Niangon du Gabon. **[Niangon from the Ivory Coast and from Gabon.]** *Bois For. Trop.* No. 76, 1961 (45–54). [F.e.span.]

The timber generally known as 'Niangon' in fact belongs to two species—*Tarrietia utilis* from the Ivory Coast and *T. densiflora* from Gabon. The two timbers are very similar and the differences noted in tests (*T. densiflora* is very slightly denser and shrinks more in seasoning) are less important than variation between samples of the same species. It is concluded that the two can safely continue to be known under the commercial name of Niangon.

811. Structure, Identification

See also Nos. 5037, 5123, 5238.

4986. LIESE, W. Elektronenmikroskopie des Holzes. **[Electron microscopy of wood.]** *Mitt. StForstverw. Bayerns* No. 31, 1960 (115–30). [G.]

A lecture discussing methods and recent findings, with illustrations of secondary or tertiary walls of *Pinus cembroides*, *P. rigida*, *P. patula*, *Picea abies* and *Widdringtonia dracomontana* (displaying wart structure), various pits (including perforations by bluestain fungi on *Pinus sylvestris*) and the crystallizing of a U-salt on a cell-wall surface.

4987. GREGUSS, P. **Some recent data on the xylotomy of the *Cycas*, *Zamia* and *Ginkgo*.** *Repr.* from *Acta Biologica, Szeged* (*n.s.*) 4 (3/4), 1958 (143–7). 8 refs. [E.e.]

In the ray cells of *Ginkgo biloba* dacrydioid pitting has been observed; this is characteristic of the Podocarpaceae but has not hitherto been observed in *Ginkgo*; it may indicate a taxonomic relationship. Nodular spiral thickenings were found in the tracheids of the accessory roots of *Cycas revoluta* as well as in the walls of the tracheids of *G. biloba*. Here too a relationship between the two genera is probable.

4988. **Identification of softwoods.** *Timb. Tr. J.* 236 (4406), 1961 (68). 1 ref.

Printed, marginally perforated cards are available at 3d. each or post paid at 18s. 6d./100 from H.M. Stationery Office, London, 100 of which suffice to cover the 114 softwoods (some not separable) of *Bull. For. Prod. Res., Lond.* No. 22 [see *F.A.* 10 No. 2609].

4989. MÄGDEFRAU, K., and WUTZ, A. Leichthölzer und Tonnenstämme in Schwarzwassergebieten und Dornbuschwäldern des tropischen Südamerika. **[Light timbers and "bottle trees" in the black-water areas and thorn bush forests of tropical S. America.]** *Forstwiss. Cbl.* 80 (1/2), 1961 (17–28). 18 refs. [G.g.e.]

An account of the wood structure and some physical and mechanical properties of four light Venezuelan timbers: *Malouetia glandulifera*, *Ambelania* cf. *laxa*, *A.* aff. *oleaefolia*, and *Pachira aquatica* (all having an oven-dry density of ⩽0·15 g./c.c.), and also a description of the histology of the wood and bark of the 'bottle-shaped' stem of *Bombax* sp. in the caatinga formation east of Lake Maracaibo.

4990. CAMBINI, A. Micrografia comparata dei legni del genere '*Castanea*'. **[Comparative micrography of woods of the genus *Castanea*.]** *Ann. Accad. Ital. Sci. For.* 9, 1960 (17–41 + 16 photos). [It.f.]

A study of microscopic anatomical characters of (1) *C. sativa*, (2) *C. dentata*, (3) *C. mollissima* and (4) *C. crenata* showed them to be relatively uniform, but with sufficient difference to make it possible to distinguish a European type (1), an American type (2), and an Asiatic type (3) and (4). The affinities between (1) and (2), which may be described as forming a Euro-American type, justify De Candolle's classification of *C. dentata* as *C. sativa* var. *americana*. There is, on the other hand, a considerable hiatus between the Euro-American and the Asiatic types. The work is illustrated by photomicrographs of each species in the radial, transverse, and tangential directions, and of their fibres.

4991. TARCHI, A. M. F. Micrografia comparata dei legni di alcune Rosaceae. **[Comparative micrography of the woods of some Rosaceae.]** *Ann. Accad. Ital. Sci. For.* 9, 1960 (57–115 + 52 photos). 68 refs. [It.f.]

Describes the anatomical and histological characters of *Spiraea chamaedryfolia*, *Rosa canina*, 3 *Pyrus* spp. and 8 *Prunus* spp. The importance of such characters for questions of compatibility and incompatibility in grafting is touched on.

811.1. Anatomical Elements and Tissues

See also Nos. 4051, 4069, 4107–11, 4128, 4734–5, 4996, 4998–9, 5011, 5015, 5017, 5019, 5046, 5064, 5225–6.

4992. MCKENZIE, D. W. **Rootstock-scion interaction in Apples with special reference to root anatomy.** *Repr.* from *Journal of Horticultural Science, London* 36 (1), 1961 (40–7). 16 refs. X.

Bark and wood-ray %s and vessel sizes were determined in roots from 4-year trees of a rootstock/scion interaction trial. Root structure of unworked rootstocks was constant and could be correlated with vigour. When stocks and scions representing extremes of vigour were combined, structural modifications attributable to scion influence were observed, but differences were less than in unworked or self-budded stocks. Restriction of growth, by using dwarfing scions or stocks or by natural flowering or fruiting, was associated with increased % of bark tissue and of wood-ray tissue, and sometimes with diminution of vessel size. *From author's summary.*

4993. MEIER, H. Über die Feinstruktur der Markstrahltracheiden von *Pinus silvestris* L. **[The fine structure of ray tracheids in *P. sylvestris*.]** *Beih. Z. Schweiz. Forstver.* No. 30, 1960 (49–54 + 10 photos). 3 refs. [G.]

A study by ordinary and electron microscope of recently formed and mature ray tracheids, including a brief description of methods of preparation. Generally only one radial row of cells was in process of differentiation, indicating that formation of the secondary cell-wall is rapid. The characteristic "spines", which are, in fact, irregular ridges of horizontal and tangential walls and are thought to provide a strengthening against lateral pressure from vertical tracheids, start from the bordered pits, which are frequent in the horizontal and tangential walls bordering on other ray tracheids and, except on the radial walls, have no torus. This lack of torus formation is thought to ensure uninhibited water conduction in the ray tracheids of the whole sapwood zone. The parenchyma cells bordering on pitted ray tracheids had no pits. The layer structure of the cell-wall of the ray tracheids is thought to be similar to that of vertical tracheids.

4994. HARADA, H., and WARDROP, A. B. **Cell wall structure of ray parenchyma cells of a softwood.** *J. Jap. Wood Res. Soc.* 6 (1), 1960 (34–41). 10 refs. [E.e.jap.] P.R.

[Cf. *F.A.* 15 Nos. 4017–8; 19 No. 4739.] Electron-microscope examination of the physical organization and composition of the ray parenchyma in sapwood from 45-year *Cryptomeria japonica*, distinguished 3 layers in the cell-walls, two broad and bi-refringent, separated by a central one of low bi-refringence. The cellulose microfibrils in the central layer revealed an almost axial orientation, which in the outer and inner layers was helical and made an angle of 30–60° with the cell axis in the outer and inner layers of the secondary wall [cf. *F.A.* 14 No. 624]. The microfibrils of the inner surface of the cell-wall (lumen side layer) showed considerable dispersion, and a non-cellulosic membrane adjacent to this inner surface did not possess the wart structure present in the xylem tracheids [cf. *F.A.* 19 No. 3389]. Methods of differential solubility and ultra-violet and interference microscopy [cf. *F.A.* 19 No. 3387] indicated almost uniform lignin distribution through the cell-wall, with a high lignin content (43·5%) in the ray parenchyma (according well with the 41–1% obtained in 1936 by A. J. Bailey from an analysis of the rays dissected from *Pseudostuga taxifolia*) vs. 35·2 and 31·6% respectively for early and late wood in which the ray tissue was present.

4995. BIERHORST, D. W. **Observations on tracheary elements.** *Phytomorphology* 10 (3), 1960 (249–305). 139 refs. O.B.D.

Deals mainly with Pteridophyta, but also with some gymnosperms and a few angiosperms, presenting illustrated descriptions, with some tentative phylogenetic theories, and a classification of tracheary elements in which a minimum of new terms is used.

811.2. Special Features and Abnormal Structure

See also Nos. 4072–3, 4556, 4701, 4875, 4877, 5001, 5045, 5202.

4996. CASPERSON, G. Über die Bildung von Zellwänden bei Laubhölzern. 1 Mitteilung. Feststellung der Kambiumaktivität durch Erzeugen von Reaktionsholz. **[Cell-wall formation in deciduous trees. Part 1. Determination of cambial activity through the production of reaction wood.]** *Ber. Dtsch. Bot. Ges.* 73 (8), 1960 (349–57). 6 refs. [G.] O.B.D.

Stems of seedlings of *Aesculus hippocastanum* in the greenhouse were artificially bent and the time and manner of formation of the G layer (i.e. the gelatinous layer in the secondary cell-wall of tension wood) was observed. The first signs of its formation were seen 1–2 weeks after bending. Between the cambium and the G layer was a zone 10–25 cells wide, still in the stage of cell-wall formation. From the time-lapse it could be concluded that an increase of 2–3 xylem cells per day must take place. The stimulus causing formation of the G layer was not received by those cells in process of forming their secondary wall, but by the cambium cells, which need 1–2 weeks' development before the G layer is formed. A stimulus of 24 hours' duration is sufficient. The rôle of the gelatinous layer in strengthening the bent stem is discussed.

811.4. Growth Rings. Early and Late Wood

See also Nos. 4051, 4107, 4171, 4924–6, 5001, 5003, 5019, 5045, 5065.

4997. KENNEDY, R. W. **Variation and periodicity of summerwood in some second-growth Douglas-Fir.** *Tappi* 44 (3), 1961 (161–6). 13 refs. P.R.

Late-wood %'s and amounts were found to vary widely between trees and years. The variation between years was related significantly to precipitation, whereas the differences between individuals were attributed to heredity and micro-site conditions. Highest late-wood %'s were found in individual trees having the longest periods available for late-wood formation. The physiological mechanism of early-wood/late-wood transition is briefly discussed. *From author's summary.*

4998. WODZICKI, T. **Investigation on the kind of *Larix polonica* Rac. wood formed under various photoperiodic conditions. I. Plants growing in natural conditions.** *Acta Soc. Bot. Polon.* 29 (4), 1960 (713–30 + 1 plate). 12 refs. [E.e.] O.B.D.

Young plants of *Larix decidua* (3 years old) and *L. decidua* var. *polonica* (2 years old) were collected at intervals from May to December and examined anatomically. Cell-wall thickness in the tracheids was correlated with the width of the tracheid differentiation layer of the cambial zone. It is likely that this thickening process is connected with the length of cell life (from the moment of division in the cambium layer to the disappearance of protoplasm at the time of full differentiation of the tracheids), and particularly with the length of the differentiation period after the cessation of radial diameter growth. There was no clear correlation between changes in radial diam. and cell-wall thickness of the tracheids, though diameter and thickness may be affected by the same environmental factors, e.g. drought. Resting buds appeared on the main shoot when the first signs of late-wood formation were found, but there is no evidence of a relationship between these two phenomena, for resting buds appeared on the lower laterals much earlier than on the main shoot, at the time when thin-walled tracheids were still forming. *From author's summary.*

4999. RUGGERI, C. Attività cambiale in *Populus × euramericana* cv. 'I 214'. **[Cambial activity in *P.* × '*canadensis*' cv. 'I 214'.]** *Pubbl. Cent. Sper. Agric. For., Roma* 4, 1960 (151–64 + 3 plates). 7 refs. [It.it.e.]

The development of the growth ring was studied over a period of one year, 3 young trees being taken each month and dissected at three different levels in the stem, and 4 others defoliated. Cambial activity started in April and was virtually over by October. False rings often occurred; they were distinguished by a well marked line of 2–3 layers of flattened fibres forming a clear division between the true ring and the beginning of the false ring, which was in some cases confined to a single series of vessels. The formation of the false rings was evident in sections taken from October onwards. In the defoliated plants, the structure of the wood varied, and there were two histological consequences: the cambial activity was prolonged, and the structure of the ring was more homogeneous, showing a rather uniform distribution of medium-sized vessels.

5000. ARENA, M. Evoluzione della cerchia legnosa in *Quercus pubescens* W. a Messina. **[The development of the annual ring in *Q. pubescens*.]** *Ann. Accad. Ital. Sci. For.* 9, 1960 (117–37 + 9 photos). 4 refs. [It.f.]

A study was made of the course of annual-ring formation in the neighbourhood of Messina during the year 1955. In the stem, development took place in 5 stages from the end of March to the end of October, with a maximum in May; in the branches it took place from the middle of March to the end of June, with a maximum in April/May. These findings are compared with those of Maugini for the same species at Florence [cf. *F.A.* 12 No. 2994].

811.5. Sapwood and Heartwood

See No. 5200.

811.6. Texture, Grain, Figure

See also No. 5029.

5001. ZIEGLER, H., and MERZ, W. Der "Hasel"-wuchs. Über Beziehungen zwischen unregelmässigen Dickenwachstum und Markstrahlverteilung. **["Wavy growth." The relationship between irregular diameter growth and the distribution of rays.]** *Holz Roh- u. Werkstoff* 19 (1), 1961 (1–8). 36 refs. [G.g.e.] P.R.

A study (illustrated) in the three primary planes of the anatomy of "wavy wood" (or "Hazel wood", so called after the broad false rays in Hazel) in *Picea abies*, *Pinus jeffreyi* and *Salix viminalis*. It was found to originate in local growth disturbances in the cambium, which led to lenticular indentations in the annual rings. In these disturbed regions, the number of rays is 40–50%, and their volume 15–20%, greater than in normal regions, but the number of cells on the tangential section of a ray is 10–20% less. The relationship between the original disturbance in the normal distribution of ray-cell initials in the cambium and the ensuing abnormal diameter growth is discussed, but no conclusions can be reached as to the cause of the phenomenon (hereditary and/or environmental). Various kinds of deviation from normal diameter growth are reviewed, and an attempt is made to clarify the concepts and terminology in this field. "Wavy wood" is important as a raw material (resonance wood) for the making of musical instruments.

811.7. Phloem; Bark

See also Nos. 4053–4.

5002. HARADA, T., SAIKI, Y., and YOSHIKURA, A. **[Application of statistics in the field of plant internal morphology. II. On the crude dry "phellodendron".]** *J. Pharm. Soc. Japan* 79 (10), 1959 (1310–3). 9 refs. [Jap.e.*e*.] O.R.S.

Describes, with illustrations, the cross-section of the secondary cortex, and discusses the ratios obtained between numbers and different types of cell (thin-walled, mucilage, etc.) and number of fibres present in the squares formed by the crossing of fibre bundles and medullary rays. Statistical application of the ratios to various species and varieties of *Phellodendron* showed that these cannot be distinguished by this method, the ratios varying with individual and habitat.

812. Physical and Mechanical Properties

See also Nos. 4346, 4558, 5037, 5094–5, 5101, 5103, 5145, 5165.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 5023–4, 5105, 5114.

5003. BIELCZYK, S., and BOBROWICZ, E. Badania niektórych własności świerkowego drewna rezonansowego pochodzenia polskiego i rumuńskiego. **[Testing certain properties of Spruce resonance wood of Polish and Rumanian origin.]** *Prace Inst. Tech. Drewna* 7 (2), 1960 (3–25). 3 refs. [Pol.russ.e.] P.R.

[Cf. *F.A.* 21 No. 2429.] The resonance modulus of wood, *K*, equals E/γ^3, where *E* is the modulus of elasticity in static bending in 1000 kg./sq. cm., and γ is density in g./c.c. It was found that *K* depended on the late-wood %, but not always on annual-ring width. *K* values were higher, and annual-ring width and late-wood % lower, in Rumanian than in Polish material; the latter had higher *E* and γ values. The upper limit for late-wood % should be set at 30% for Polish, and at 35% for Rumanian material.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 4073, 4107, 5134, 5138, 5183.

5004. Loos, W. E. **The relationship between gamma ray absorption and wood moisture content and density.** *For. Prod. J.* 11 (3), 1961 (145–9). 8 refs.

Describes tests on specimens of *Liriodendron tulipifera* sapwood, 6 cm. thick in the radial direction—the direction of radiation passage—at moisture contents of 0, 9, 18%, at fibre saturation, and at full saturation, using a Pb^{210} source. Results indicate that, if either the basic density or the m.c. is known, the other value can be determined non-destructively, rapidly, and accurately by measuring γ-ray attenuation through a given thickness. The presence of shrinkage below fibre saturation point requires the use of separate γ-ray absorption models above and below this point. From fibre saturation to oven dryness, the linear absorption coefficient closely follows the rate of shrinkage.

5005. James, W. L. **Calibration of electric moisture meters for Jack and Red Pine, Black Spruce, Paper Birch, Black Ash, Eastern Hemlock, and Bigtooth Aspen.** *Rep. U.S. For. Prod. Lab., Madison* No. 2208, 1961. pp. 7 + 1 photo, 10 gphs., 12 tbls. 5 refs.

In order to determine specific corrections for resistance-type and power-loss-type moisture meters when used on 7 U.S. species for which such corrections were previously unavailable, direct current electrical resistance and radio-frequency absorption indexes at 80° F. and m.c.'s ranging from ca. 6% to near fibre saturation point were determined for *Pinus banksiana*, *Picea mariana*, *Betula papyrifera*, *Fraxinus nigra*, *Tsuga canadensis*, *Populus grandidentata*, and *Pinus resinosa*. The measurements were made with commercial moisture meters—a specially calibrated resistance type and two models of the R.F. power-loss type—and moisture-meter readings were compared with the actual m.c. of the same material as determined by the oven-drying method.

5006. Sadoh, T. **Studies on the sorption of water vapour by wood hemicellulose. III. Heat of adsorption. IV. Swelling and dissolving.** *J. Jap. Wood Res. Soc.* 7 (1), 1961 (1–7). 23 refs. [E.] P.R.

(III) Sorption of water vapour on hemicellulose isolated from *Fagus crenata* was measured at 16, 20, 30 and 40° C. From the sorption isotherms plotted, it was found that the % reductions in equilibrium m.c. of the hemicellulose with each 10° rise were 0·5 at 10%, 0·8 at 30%, and 1·3 at 50% r.h. (IV) Presents results of a study of the volumetric swelling and dissolving that are accompanied by the sorption of water on specimens of *F. crenata* hemicellulose film. From the graph showing the relationship between volumetric swelling and m.c., it is suggested that swelling of the hemicellulose coincides with its adsorption of water. It is concluded that the sorptive and swelling behaviours of hemicellulose resemble those of the amorphous region of cellulose, except that the hemicellulose swells infinitely because it is made up of smaller molecules than cellulose.

5007. Sadoh, T. **[Studies on the sorption of water vapour by wood hemicellulose. V. Hysteresis.]** *J. Jap. Wood Res. Soc.* 7 (2), 1961 (51–3). 13 refs. [Jap.jap.e.*e.*] P.R.

[Cf. *F.A.* 21 No. 4891; 22 No. 987.] In an investigation of the hysteresis effect (h.e.) in the sorption of water vapour on hemicellulose isolated from *Fagus crenata*, adsorption and desorption isotherms for the hemicellulose were determined at 20° C. over a range of 0–93% r.h., and the adsorption/desorption ratio calculated. The h.e. in the sorption isotherm for the hemicellulose was very marked at low r.h.'s. Volumetric change (v.c.) with variation of m.c. was determined for both adsorption and desorption; the m.c./v.c. curve of desorption agreed with that of adsorption at >20% m.c., but at <20% desorption volume was the greater. The hemicellulose polymer network is assumed to move so slowly towards equilibrium that the appearance and disappearance of sorption surfaces are irreversible.

5008. Nowak, K. Ciśnienie pęcznienia drewna ścieśnionego przez kilkakrotne mechaniczne hamowanie jego pęcznienia w kierunku promieniowym. **[Swelling pressure of wood compressed by repeated mechanical restraint of its swelling in the radial direction.]** *Prace Inst. Tech. Drewna* 7 (2), 1960 (95–105). 3 refs. [Pol.russ.e.] P.R.

Oven-dry pieces of Scots Pine sapwood were clamped so as to restrain them in the radial direction, and then subjected to 5 or 10 cycles of soaking (in water at 20° C. for 1 week) and drying (to oven-dryness). These pieces were then cut into samples and their swelling pressure and free swelling determined. Results are tabulated in detail. It was found that swelling pressure decreased in the tangential direction with increasing number of cycles, but remained unchanged in the radial direction. The free linear swelling of wood also decreased in the tangential direction with increasing number of cycles, and increased in the radial direction.

5009. Peck, E. C. **News and views of this kiln drying business. Method of calculating shrinkage or swelling of wood with change of moisture content.** *Rep. U.S. For. Prod. Lab., Madison* No. 1769–27, 1960. pp. 3. P.R.

Tabulates shrinkage values for many U.S. hardwoods and softwoods, in terms of % of green dimensions. These are convertible into dimensional changes (in inches) by using the following formula:

$$S = (M_I - M_F)D/\left(\frac{30}{S_T \text{ or } S_R} - 30\right) + M_I$$

where S = shrinkage or swelling in inches, M_I = initial m.c. in % (maximum is 30), M_F = final m.c. in % (maximum is 30), D = dimension at initial m.c. in inches, 30 = fibre saturation point in %, S_T = total tangential shrinkage, in %, divided by 100, S_R = total radial shrinkage, in %, divided by 100. Neither M_I nor M_F can be greater than 30% since this is the m.c. at which, when drying, wood starts to shrink, or at which, when absorbing moisture, it reaches maximum dimensions.

5010. SCHNIEWIND, A. P. **On the nature of drying stresses in wood.** *Holzforschung, Berlin* 14 (6), 1960 (161–8). 34 refs. [E.e.g.] P.R.

The drying stresses are classified into three orders on the basis of the scale on which the stress pattern is repeated. These orders are further subdivided according to the origin of the drying stresses. First-order stresses occur in the individual cell and result from the unequal shrinkage potential of cell-wall layers and from hydrostatic tension forces in the cell cavity. Second-order stresses occur in tissues and result from unequal shrinkage potential of the various tissues. Third-order stresses occur in larger pieces of wood and result from the moisture gradients found in normal drying and from gross variations in shrinkage potential. Hypothetical examples of these three orders are given, and the potential stresses, which would develop if creep and relaxation effects were absent, are calculated and found to be very large. It is demonstrated that all orders of drying stresses influence the overt behaviour of wood. The relationship between the rheological properties and the shrinkage of wood is discussed. *From author's summary.*

5011. KEITH, C. T. **Some effects of repeated drying and wetting on wood properties.** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 23, 1960. pp. 16. 15 refs.

Repeated drying and wetting treatments were carried out on small test samples of 5 softwood and 5 hardwood species representing different anatomical types, in order to relate differences in strength and in patterns of dimensional change to different anatomical arrangements of the wood tissues. Dimensions of the samples, in both saturated and dry condition, were recorded after each wetting and each drying treatment, and measurements of oven-dry wt. and green volume (by immersion in Hg) were made at intervals during the treatments, as were mechanical tests on matched groups of samples to determine the strength of wood in longitudinal shear. Results indicated that the treatments (up to 50 cycles) showed no general trend toward either increased or decreased shrinkage or swelling for the 10 species studied. After some initial tangential expansion, dimensions all tended to decrease, but changes in dimensions and in the patterns of behaviour in shrinkage and swelling varied considerably for the different species and drying methods used. The dry wt. of all samples decreased through cyclic drying, though only those oven-dried directly from the green condition lost more weight than might be expected, through the loss of water-soluble extractives. Only minor changes in basic density were observed, since the volume of samples in saturated condition decreased as well as the dry wt. after repeated drying and wetting cycles. Strength || was significantly reduced by repeated treatments, the first cycle having a far greater effect than any subsequent one, while samples dried rapidly at oven temperatures declined in strength more quickly than matched samples dried gradually at room temperatures. Structural deterioration and strength losses during drying are mainly attributable to the development of planes of weakness and failure within samples, resulting from differences in shrinkage potential of the different wood tissues, and woods with contrasting component tissues are subject to greater structural deterioration than woods of more nearly uniform structure.

5012. **Wetting of wood.** *Extr.* from *Rep. Timb. Developm. Ass., Lond. 1960*, 1961 (30–1).

A fundamental study was made of the energy changes occurring when a wood surface is wetted by a liquid such as a finish or glue. Angles of contact of water and three other liquids of different surface tension were measured by a special microscope technique on Beech, Parana Pine, Greenheart, and Western Hemlock, the mean of 30 measurements being found. The linear relation between the cosine of the contact angle and the liquid surface tension established by Zisman for many low-energy solids was found to be valid; from it energy changes during any wetting process can be calculated. An attempt was made to assess the effect of roughness, by measuring roughness profiles. The application of the results obtained is mainly to ease spreading and the preparation of glues, finishes, and preservatives. Adhesion failure is usually not covered since this usually occurs in the glue or in the resin, and not at the interface between the two.

5013. NYLINDER, P. Fortsatta undersökningar över barkningsmetodens inverkan på massavedens torkning och vattenupptagning. [**Further studies on the effect of barking method on drying and water absorption of pulpwood.**] *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. *R*25, 1959. pp. 19 + 4 photos, 37 tbls. 3 refs. [Sw.sw.e.]

[Cf. *F.A.* 19 No. 4953.] A further study, including wood felled at 4 different periods, indicated that in hand-barked wood both drying rate (*a*) and water absorption (*b*) were greater than in machine-barked wood if it had been felled in spring, but only (*b*) was greater if it had been winter-felled. In most cases the differences between hand and machine barking were of no practical importance. Wood felled in March took up more water than wood felled in May. *From author's summary.*

5014. HALVORSEN, B. Opptak av vann og opptak av impregneringsvæske hos gran. [**Uptake of water and preservative in Spruce.**] *Tidsskr. Skogbr.* 69 (1), 1961 (19–22). [Nor.]

Describes preliminary tests suggested by the observation that sinkers, particularly logs that have sunk close to the launching place, can sometimes be pressure-impregnated satisfactorily. When two parts of the same log were compared, one (*a*) submerged for 5 months, the other (*b*) pressure-treated, there was a tendency for % weight increase due to impregnation of (*b*) to show positive correlation with weight increase due to water uptake in (*a*), though there was considerable scatter. None of the 50 logs tested were sinkers. Water uptake, as expected, increased with decreasing wood density. In logs showing large water uptake there appeared to be special zones of marked permeability.

5015. KISHIMA, T., and HAYASHI, S. **[Microscopic observation of the course of water penetration into wood.]** *Wood Res., Kyoto* No. 24, 1960 (33–45). 3 refs. [Jap.jap.e.*e*.]

[Cf. *F.A.* 18 No. 900.] Presents the results of an experiment (the preliminary nature of which is stressed) aimed at tracing the course of water penetration (w.p.) into (*a*) 3 softwoods (*Chamaecyparis obtusa*, *Cryptomeria japonica*, *Pinus thunbergii*) and (*b*) 3 hardwoods (*Fagus crenata*, *Fraxinus spaethiana*, *Shorea negrosensis*), based on microscopic observations using a 0·5% acid-fuchsin stain. W.p. was found to be effected mainly through the tracheids in (*a*) and vessels in (*b*); in (*b*) it was markedly obstructed by tyloses, and in (*a*) somewhat assisted by resin canals. The obstruction caused by rays, even the so-called broad rays, is one of the main factors controlling penetrability (particularly in *P. thunbergii*). Transverse w.p. is negligible save in *P. thunbergii*, where it is assisted by the relatively large axial penetrability of the rays.

5016. STAMM, A. J. **Combined bound-water and water-vapour diffusion into Sitka Spruce**. *For. Prod. J.* 10 (12), 1960 (644–8). 11 refs.

Experimental diffusion coefficients [d.c.] were computed from the rates at which edge-grained Sitka Spruce heartwood veneer $\frac{1}{16}$ in. thick, (*a*) absorbed water vapour and (*b*) swelled at 80° F. and various r.h.'s. These d.c.'s showed good agreement with the theoretical d.c. for the tangential direction, computed, for a mean m.c. of 20%, by combining the d.c. of water vapour through the fibre cavities and pit system [cf. *F.A.* 22 No. 996] and the d.c. of bound water through the cell-walls, in series and in parallel [cf. *F.A.* 22 No. 2365] in conjunction with capillary structural data (calculated value, 78×10^{-8} sq. cm./sec.). The discontinuous bound-water diffusion, i.e. that part of it occurring through the (vertical) portions of the cell-walls in series with the lumina, was the chief factor determining the experimental d.c., suggesting that this diffusion path offers less resistance than the vapour path through the pit membranes (which is in parallel with it) but more resistance than the vapour path through the fibre cavities (which is in series with it). The effect of the continuous bound-water diffusion through the horizontal cell-walls was small.

5017. STAMM, A. J., and WAGNER, E. **Determining the distribution of interstructural openings in wood**. *For. Prod. J.* 11 (3), 1961 (141–4). 13 refs.

By measuring the pressure required to cause increasing amounts of octyl alcohol to pass through water-saturated wood, the size distribution of the interstructural openings (pit-membrane pores in softwoods and hardwoods, and also tylose pores in hardwoods) could be analysed, the pressure needed to force the water/octyl-alcohol interface through a capillary depending on the effective radius of the capillary and the interfacial surface tension between the two immiscible liquids. Data and calculations are given for heartwood cross-sections of air-dry Sitka Spruce 0·5–1·5 in. thick. The most effective capillary radius ranged from 135 to 450 mμ, and the most probable effective radius increased from 30 to 80 mμ with a decrease of specimen thickness from 1·5 to 0·5 in.

5018. MILLER, D. J. **Permeability of Douglas Fir in Oregon**. *For. Prod. J.* 11 (1), 1961 (14–6). 5 refs.

A study of permeability to air and liquids (mainly creosote and $CuSO_4$ solution) under pressure along the grain, showed Douglas Fir heartwood from the eastern parts of Oregon to be generally much less permeable than that from the west. This apparently reflected differences between the varieties *viridis* and *glauca*. Though very refractory heartwood permitted little or no air flow and the most permeable heart- or sapwood >10 c.c. air/sec., air flow was not a reliable indicator of permeability. $CuSO_4$ solution usually penetrated more deeply than creosote into wood of low permeability. Differences in ring structure, late-wood % or sp. gr. were not clearly related to penetration or retention, and small particles of permeable and refractory heartwood lost the same % of weight in alcohol/benzene solubles, but the refractory wood lost weight faster. Permeable heartwood appeared, however, to have both longer fibres in early and late wood, and larger lumina in early wood than refractory heartwood.

5019. BUCHER, H. Über morphologische Untersuchungen in der Holzchemie und die Diffusion von Flüssigkeiten in Fichtenholz. **[Morphological investigations in wood chemistry and the diffusion of liquids in Spruce wood.]** *Beih. Z. Schweiz. Forstver.* No. 30, 1960 (21–9 + 4 photos). 20 refs. [G.g.]

Describes a study on the topochemistry of the chemical breakdown of wood, in which diffusion processes were observed microscopically on Spruce wood dyed with a reactive dye (i.e. one incorporated in the cellulose molecule) and treated with a bleaching agent (an acid chlorite solution). After 45 minutes, the early wood was bleached, while most of the late wood remained strongly coloured. Colour transitions from early to late wood were not sharp. On the border of the annual ring, the last row of late-wood cells was completely, and the last but one somewhat bleached, with occasional bleaching in the third row, but not beyond. These last rows, but not the others, were connected among themselves and with the first early-wood row of cells by numerous tangential pits, which differed morphologically from radial bordered pits. Their physiological significance in the resumption of cambial activity is touched upon.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 4106–11, 4322, 5004, 5011, 5014, 5025, 5061–4, 5066, 5186.

5020. SMITH, D. M. **Method of determining specific gravity of wood chips**. *Rep. U.S. For. Prod. Lab., Madison* No. 2209, 1961. pp. 3 + 2 photos, 1 dgm., 2 tbls. 3 refs.

Describes a weight/volume method developed at Madison for green wood chips. It is substantially the same as that used to determine the green or soaked volume of larger wood samples by the buoyancy method [see *F.A.* 15 No. 4057].

5021. PETERSON, O. Flytbarheten hos vinteravverkad tall med hänsyn till barkningsgrad och avläggningsförhållanden. **[Buoyancy of winter-felled Pine logs with various degrees of barking and under different landing conditions.]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. *R*23, 1959. pp. 47 + 28 tbls. 11 refs. [Sw.sw.e.*e.*]

In a field study at Sturuman (lat. 65°N), on ca. 1500 logs of average densities, drying increased with degree of barking (viz. (*a*) 100%, (*b*) 20% and (*c*) nil), with drying time, and with decreasing diameter. Logs stored on ice in low stacks dried somewhat less (because the pre-submergence period was shorter) than logs stored similarly on land. In high stacks, drying conditions were slightly less favourable. With ice-stored wood (with its longer period in water), (*b*) and (*c*) took up more and (*a*) less water than their land-stored counterparts, but final weights in % of original weight, were always higher, and in (*c*) exceeded the original weight by 9%. Risk of sinking (computed on an assumed buoyancy limit of 975 kg./cu. m.) increased rapidly with decreasing heartwood %, and, for ice-stored (*c*) logs with ca. 20% heartwood, was ca. 10%. For (*a*) logs, risk was negligible, and for land-stored (*c*) it never reached 1%. [Cf. *F.A.* 19 No. 4952.]

5022. STEMSRUD, F., and HALVORSEN, B. Brannskadet virkes flyteevne. **[Floatability of wood damaged by fire.]** *Tidsskr. Skogbr.* 69 (1), 1961 (23–5). [Nor.]

In preliminary laboratory tests, the mean sp. gr. of (*a*) 8 butt bolts from Pine severely damaged by fire in June, felled in Sept. and stored barked until June, was greater than that of (*b*) controls (undamaged trees, felled in winter and stored till spring). The difference remained fairly constant for ca. 5 months. Sp. gr. was then >0·8 in 7 of (*a*) and 3 of (*b*). The tendency of fire-damaged wood to sink is thought to be largely due to higher moisture content at the start of floating if trees are allowed to stand and deteriorate for some time before they are felled.

812.7. Strength Properties: General

See also Nos. 5011, 5063, 5066, 5079, 5087–8, 5090–3, 5100–3, 5108, 5154.

5023. **Non-destructive testing. (1) Ultrasonic techniques. (2) Resonance methods and acoustic damping.** *Extr.* from *Rep. Timb. Developm. Ass., Lond. 1960*, 1961 (15).

(1) The problem of measuring the elastic properties of Ash blocks used as capping for reinforced concrete piles during driving was solved by ultrasonic velocity measurements. The constants derived from static-loading tests bore no relation to those derived from strain measurement made during driving of the piles by impact loading, whereas constants derived from ultrasonic pulse velocities were related and invariably higher than the static measurements. (2) Laminated tennis racquets were subjected to a test for gauging the quality of timber and glue-lines, involving measurement of the rate at which sound waves are absorbed. Each racquet was vibrated at its fundamental resonant frequency in flexure, by means of an electrical oscillator which was then suddenly switched off. The vibrations decay exponentially and the period between two known successive amplitudes of vibration is measured with a dekatron counter. A soundly glued racquet will continue vibrating longer than one containing a broken glue-line. Further tests are in progress, using continuous vibrations and noting the changes in the fundamental frequency of flexural and longitudinal vibrations between sample racquet blanks taken from several days' factory production.

5024. MATSUMOTO, T. **[Studies on the dynamic modulus E of wood by transverse vibration. V. The effect of temperature on the dynamic modulus of wood.]** *J. Fac. Agric. Iwate Univ.* 5 (1), 1960 (20–4). 7 refs. [Jap.e.*e.*] O.R.E.

[Cf. *F.A.* 21 Nos. 3688–9.] The vibration frequency of *Thujopsis dolabrata* and *Cryptomeria japonica* specimens was measured at temperatures from −10° to 70° C. Young's modulus decreased with increasing temperature, but not linearly.

5025. WILLISTON, E. M. **New stress values for the coast white woods.** *For. Prod. J.* 10 (12), 1960 (621–5). 5 refs.

Presents data on sp. gr. and strength properties of this group (*Tsuga heterophylla*, *Abies amabilis*, *A. grandis* and *A. procera*) based on 185 Hemlock and 137 Firs from a wide area. It is suggested that the stress values now assigned to these timbers, which are partly derived from data based on very small and unrepresentative samples and partly only from analogy with *A. concolor* data in the U.S.D.A. Wood Handbook [see *F.A.* 17 No. 1900], are too low.

5026. SEKHAR, A. C., and NEGI, G. S. **Investigation of strength properties of the species of genus *Gardenia*.** *Indian For.* 87 (3), 1961 (198–200). 6 refs.

Tabulates data from tests on green *G. gummifera* and *G. latifolia* from Madhya Pradesh, *G. lucida* from Orissa, and *G. turgida* from Bombay. According to the classification described by Limaye [see *F.A.* 19 No. 2268], all were heavy, moderately strong, very tough, and hard, the first two giving higher values than the others in most properties. The wood is suitable for small articles requiring a close-textured wood, for tool handles and some sporting goods.

5027. SEKHAR, A. C., BHARTRI, R. K., and RAWAT, M. S. **Comparative studies on natural and plantation Teak.** *Indian For. Bull.* (*n.s.*) No. 227, 1960. pp. 10 + 1 dgm. 8 refs.

Five logs each of (*a*) natural and (*b*) plantation-grown Teak from 4 localities in India and one in Burma, were tested for a number of strength properties. Preliminary results (not yet analysed statistically) indicate no significant differences between (*a*) and (*b*).

5028. PETRI, V. N., and ANAN′IN, P. I. Ocenka pročnosti drevesiny posle teplovoj suški. **[Evaluating wood strength after hot drying.]** *Lesn. Ž.*, *Arhangel'sk* 3 (3), 1960 (116–9). 7 refs. [Russ.russ.]

Freshly felled wood [species not stated] was dried (*a*) in a room at 20° C., (*b*) with superheated steam at 120°, and (*c*) in petrolatum at 120°. After drying, the samples were held in chambers where r.h. was kept constant (at values from 50 to 92%) until equilibrium m.c. was reached. The compression strength ||, static bending (radial and tangential), and shear || (radial and tangential) were then determined, and the values also converted for the standard 15% m.c. It was found that conversion to 15% m.c. distorted the true strength values of wood dried at different temperatures by as much as 18·5%. In order to evaluate the strength of wood after drying, a range of strength values should be given, corresponding to the temperature and r.h. of the air where the wood is to be used.

5029. WEDELL, E. **Influence of interlocked grain on the bending strength of timber, with particular reference to Utile and Greenheart.** *J. Inst. Wood Sci.* No. 7, 1961 (56–72). 4 refs.

A study of the influence of interlocked grain on the bending strength of timber has shown that in *Entandrophragma utile* and *Ocotea rodiaei* the ultimate bending stress (*a*) and the modulus of elasticity (*b*) are affected by the presence of interlocked grain, and the effect on (*a*) is extremely marked. It is also shown that beams of these species, when loaded with the quarter-sawn face as the depth of the beam (i.e. load applied to the flat-sawn edge), give greater values for (*a*) and (*b*) than beams loaded with the flat-sawn face as the depth. It is further shown that quarter-sawn beams are less likely to fail suddenly without warning cracks. This is attributed to the influence of the angle made by the spiral growth layers with the plane of loading. 'Small clear' specimens indicate that interlocked grain has a slightly less marked effect than simple spiral grain on bending strength properties. *From author's summary.*

5030. SUMIYA, K., KAWAGOE, N., and SUGIHARA, H. **[On the size effect in the compression strength of Hinoki (*Chamaecyparis obtusa* Sieb. et Zucc.).]** *Wood Res., Kyoto* No. 24, 1960 (46–8). 1 ref. [Jap.jap.*e*.]

Describes compression tests made || and ⊥ (in the radial and tangential directions) on *C. obtusa* blocks of 4 sizes (*a*) 50 × 50 × 100 mm., (*b*) 20 × 20 × 40 mm., (*c*) 10 × 10 × 20 mm., (*d*) 5 × 5 × 10 mm., and tabulates, in kg./sq. cm., the mean compression strengths of the blocks according to their size and other factors, e.g. sp. gr. (oven-dry), m.c., annual ring width.

5031. OGATA, S., and OKOHIRA, Y. **[On the compression parallel to grain and hardness tests of Radiata Pine grown in New Zealand.]** *J. Jap. Wood Res. Soc.* 6 (6), 1960 (223–6). 6 refs. [Jap.jap.e.*e*.] P.R.

Tabulates test results for compression || and hardness. Graphical data indicate that the relationship between compression strength (c.s.) || and sp. gr. is linear, as is that between end hardness and sp. gr. No significant correlation between side hardness (radial and tangential) and sp. gr. was observed. The relationship between c.s. || and annual-ring width (a.r.w.) can be expressed in an exponential equation within the a.r.w. range of 4·5–20·0 mm. A graph showing the relationship between c.s. || and end hardness is included.

5032. OGARKOV, B. I. Vlijanie temperatury na pročnost' pri sžatii natural'noj i pressovannoj berezy. **[Effect of temperature on the compression strength of natural and compressed Birch.]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (123–6). 4 refs. [Russ.russ.]

Samples (*a*) compressed in one direction, and (*b*) natural, were tested in compression || at 20, 40, 60, 80 and 100° C. In both (*a*) and (*b*), strength decreased linearly with increasing temperature, but repeated heating did not reduce it any more than a single heating.

5033. KUMAR, V. B. **Compression strength of boiled tropical timbers.** *Norsk Skogind.* 15 (1), 1961 (30–1). 2 refs. [E.] P.R.

Heartwood samples of 5 Indian species, representing a range in density from 0·38 to 0·80 g./c.c. and in treatability from easy to refractory, were boiled for 1–3 hours. Tabulated results show the compression strength after different boiling periods and the % loss of strength as compared with untreated controls. The effect of length of treatment was slight and the loss of strength appeared to be similar for all species.

5034. GOULET, M. **Dependence of transverse tensile strength of Oak, Beech and Spruce on moisture content and temperature within the range of 0° to 100° C.** *Transl. For. Prod. Lab. Can.* No. 141, 1961. pp. 10. Transl. from *Holz Roh- u. Werkstoff* 18 (9), 1960 (325–31). [See *F.A.* 22 No. 2384.] Limited distribution.

5035. KING, E. G. **Time-dependent strain behaviour of wood in tension parallel to the grain.** *For. Prod. J.* 11 (3), 1961 (156–65). 44 refs.

Supplements and recapitulates two earlier papers [cf. *F.A.* 20 No. 3704]. Based on single- and multiple-cycle creep tests, with or without recovery between cycles, on 11 domestic and tropical species, relationships of creep to stress, strain, strength, elasticity, density factors, loading speed etc. are discussed. Creep was proportional to the logarithm of time for the first 30–40 min. of sustained load, but later increased faster. A large % of the difference between species with regard to creep response in and below the threshold-of-set region can be accounted for by differences in sp. gr. and maximum tensile strain. Species of low sp. gr. and high extensibility creep more than those with high sp. gr. and low extensibility.

5036. NEDBAL, F. Die Anwendung des Höppler-Konsistometers zur Verformungsmessung an Kiefernsplintholz. **[Using the Höppler "consistometer" for deformation measurements on Scots Pine sapwood.]** *Holz Roh- u. Werkstoff* 19 (1), 1961 (9–14). 3 refs. [G.g.e.] P.R.

Using the consistometer [see *F.A.* 20 No. 2307] with an elastometer device, the effects of wood density, moisture content, temperature, load, and time on the flow-behaviour of the wood were determined, and also the effect of interrupting the loading (while maintaining the deformation obtained) on relaxation and plastic deformation. Data are presented in tables and graphs. The aim of the experiments was primarily to investigate the suitability of this elasto-plastic measuring method for wood, and it is concluded that the method is suitable.

5037. Sachsse, H. H. Zur Methodik der Strukturprüfung von Hölzern mit dem Nadelstichverfahren. **[Investigating the structure of woods by the needle-probe method.]** *Holzforschung, Berlin* 14 (6), 1960 (168–78). [G.g.e.] P.R.

Critically examines the needle-probe method of determining hardness [see *F.A.* 14 No. 1510], and describes in full detail the development, design and use of a somewhat similar instrument, in which the force necessary to drive the needle into the wood to a pre-determined depth is measured. The instrument is suitable for studying the structure of stem disks up to 45 cm. diam. Its advantages are discussed, especially its ability to demonstrate numerically changes in wood properties resulting from a whole complex of factors.

813. Wood Chemistry

See also Nos. 4875, 4877, 5232–3.

5038. Burdė, N. L., and Kozlov, V. N. Himičeskij sostav nekotoryh drevesnyh porod, proizrastajuščih na Urale. **[Chemical composition of some woody species growing in the Urals.]** *Lesn. Ž., Arhangel′sk* 3 (4), 1960 (134–40). 22 refs. [Russ.]

Tabulates the contents of cellulose (Kürschner), pentosans, lignin (König), ether and hot-water extracts, reducing substances hydrolysable easily and with difficulty, polyuronic acids, methoxyl groups, and ash, of the wood at b.h., and in most cases also at a higher point, for the following: Scots Pine (6 different combinations of age, stand type and site class), *Picea* [*abies*] (1), *Larix* sp. (2), *Betula* [*verrucosa*] (4), *B. pubescens* (1), *Alnus incana* (1), *A. glutinosa* (2), Aspen (1), *Salix caprea* (1), and *Prunus padus* (1). [Apparently only one tree was sampled from each age/stand-type/site-class combination.]

5039. Burdė, N. L., and Kozlov, V. N. Himičeskij sostav drevesiny možževel′nika, proizrastajuščego na Severnom Urale. **[Chemical composition of the wood of *Juniperus communis* growing in the N. Urals.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (143–4). 3 refs. [Russ.russ.]

Tabulates the contents of the various components, separately for stem- and branchwood.

5040. Chutorschtschikow [Hutorščikov], I. S. Die chemische Zusammensetzung des Holzes der gemeinen Kiefer und der sibirischen Zeder. **[Chemical composition of the wood of *Pinus sylvestris* and *P. sibirica*.]** *Bumažnaja Promyšlennost′, Moskva* 35 (1), 1960 (15). [Russ.] From *abstr.* in *Holzforschung, Berlin* 15 (1), 1961 (25). [G.] P.R.

P. sylvestris from E. Siberia contained less cellulose and pentosans, but more lignin and more substances extractable with organic solvents, than *P. sylvestris* from the Leningrad region. *P. sibirica* contained 47·61% cellulose, i.e. a content between that of *P. sylvestris* and *Larix sibirica* [cf. *F.A.* 22 No. 3599].

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 4107, 5006–7, 5064, 5247.

5041. Higuchi, T., Is[h]ikawa, H., and Hasegawa, M. **Chemical nature of lignin in cultured tissues of Eastern White Pine and "Kiri" (*Paulownia tomentosa*) tree.** *J. Jap. Wood Res. Soc.* 6 (6), 1960 (229–32). 10 refs. [E.e.jap.] P.R.

Reports on the chemical nature of milled wood lignins prepared by Björkman's method from cultured tissues of *Pinus strobus* and *Paulownia tomentosa* after alkaline nitrobenzene oxidation and ethanolysis. The well known aromatic aldehydes and Hibbert's monomers were identified, and the ultraviolet and infra-red absorption spectra of the respective lignins gave the characteristics of those of conifer and angiosperm lignins. However, the present lignins gave a smaller amount of methoxyl than those of mature woods, the *P. tomentosa* lignin in particular being largely formed with guaiacyl propane units, in which respect its nature seemed to resemble that of conifer lignin.

5042. Robert, A., and Desmet, J. Étude spectrographique dans l'infrarouge d'une lignine native de *Populus canescens* Sm. **[An infra-red spectrographic study of a native lignin of *P. canescens*.]** *C.R. Acad. Sci., Paris* 251 (3), 1960 (430–2). 2 refs. [F.f.] O.R.S.

The study showed similar, but not identical, curves for the native lignin and 4 fractions from it. It is concluded that the native lignin is a mixture of substances very closely related chemically.

5043. Desmet, J. Séparation par électrophorèse des constituants d'une lignine native de *Populus canescens*. **[Electrophoretic separation of the constituents of a native lignin of *P. canescens*.]** *C.R. Acad. Sci., Paris* 251 (5), 1960 (780–2). 3 refs. [F.f.] O.R.S.

Fourteen fluorescent constituents were obtained, some naturally coloured, and also a non-fluorescent, colourless substance giving a positive reaction with phloroglucin/HCl. None of the fractions obtained in the previous study [see preceding abstract] is a pure substance.

5044. Sakakibara, A., and Nakayama, N. **Hydrolysis of lignin with dioxane and water. I. Formation of cinnamic alcohols and aldehydes.** *J. Jap. Wood Res. Soc.* 7 (1), 1961 (13–8). 11 refs. [E.e. jap.] P.R.

Data on hydrolysis products from *Picea jezoensis*, *Fagus crenata* and *Populus nigra* wood meal.

5045. Lee, C. L. **Crystallinity of wood cellulose fibres studied by X-ray methods.** *For. Prod. J.* 11 (2), 1961 (108–12). 25 refs.

A study on pulp and holocellulose made from various woods. For a 33-year *Tsuga heterophylla*, crystallinity increased markedly from the 3rd to the

15th annual ring, but only slightly from the 15th to the 21st ring, with slightly higher values for late than for early wood. It was considerably less in compression wood from an 80-year Douglas Fir than in normal wood from the same section, but considerably more in tension wood from a 28-year *Populus trichocarpa* than in normal wood of the same age. In normal and reaction wood of Douglas Fir and Poplar, crystallinity increased with increasing decay by *Poria incrassata* and *P. monticola*.

5046. PERILÄ, O., and HEITTO, P. **The chemical composition of wood cells. 1. Carbohydrates of Pine cells**. *Suomen Kemistilehti, Helsinki* 32*B* (5/6), 1959 (76–80). 10 refs. [E.e.] L.S.

Tracheids amounting to 97·8%, and ray fibres to 1·8%, by weight, were obtained by mechanical fractionation of holocellulose prepared from Scots Pine by the monoethanolamine method. The hydrolysate of the tracheids proved to be richer in mannose and poorer in xylose than that of the ray fibres. Both cell fractions contained nearly equal amounts, ca. 20%, of hemicelluloses soluble in an alkaline borate solution (17·5% NaOH and 4% H_3BO_3). The greater part, nearly 70%, of the monosaccharides in the hemicellulose hydrolysate of the tracheids was mannose, the xylose content being ca. 20%; there was ca. 50% xylose in that of the ray fibres and only 30% mannose.

5047. MORAK, A. J., and WARD, K., JR. **Investigations of the mannans and xylans in softwood. II**. *Tappi* 44 (1), 1961 (12–22). 34 refs. P.R.

[Cf. *F.A.* 21 No. 5116.] An investigation of the sequential use of aqueous KOH, alkaline KBO_2, and NaOH extractions from *Picea abies* chips and pulps showed most of the xylans to be removed as a heterogeneous mixture containing large amounts of glucose and mannose. The second stage removes a glucomannan (ca. 75% mannan) in a pure state (ca. 1% xylan), even without fractionation. The product from the final extraction is also very low in xylan, but there is much more glucose than mannose in the hydrolysate. The X-ray diffraction patterns and molecular size of the unfractionated hemicellulose mixtures were determined and are discussed. *From authors' summary*.

5048. LAIDLAW, R. A., FARMER, R. H., and SMITH, G. A. **The polysaccharides of European Beech (*Fagus sylvatica*.) A preliminary survey**. *Holzforschung, Berlin* 15 (1), 1961 (15–8). 27 refs. [E.e.g.] P.R.

Acid hydrolysis of the extractive-free wood yielded *d*-galactose, *d*-glucose, *d*-mannose, *l*-arabinose, *d*-xylose, *l*-fucose, *l*-rhamnose, 2-O-methyl-*d*-xylose and 2-O-methyl-*l*-fucose, along with a mixture of acidic materials. Further hydrolysis of the acids gave uronic acids and a mixture of neutral sugars, principally xylose, galactose and rhamnose. Fractional extraction experiments were also carried out. The general nature of the hemicelluloses of Beech is discussed in the light of these results. *From authors' summary*.

5049. BOWERING, W. D. S., MARCHESSAULT, R. H., and TIMELL, T. E. **Preparation and properties of a 4-*O*-methylglucoxylan from the wood of White Birch (*Betula papyrifera*, Marsh)**. *Svensk Papp-Tidn*. 64 (6), 1961 (191–4). 18 refs. [E.e.sw.g.] P.R.

[Cf. *F.A*. 22 No. 2397.] An O-acetyl-4-O-methylglucuronoxylan from the wood has been completely esterified with propylene oxide and subsequently reduced with sodium borohydride to yield a 4-O-methylglucoxylan with only a trace of acid groups; its properties were studied.

5050. ROUDIER, A. J., and EBERHARD, L. Recherches sur les hémicelluloses du bois de pin maritime des Landes *Pinus pinaster* Soland. subsp. *P. maritima* Fieschi et Gaussen). I. **[The hemicelluloses of *P. pinaster* from the Landes. I.]** *Bull. Soc. Chim. France* 1960 (11/12), (2074–85). 85 refs. [F.f.] O.R.S.

The separation, identification and study of the constitution of aldotrio-uronic, aldobio-uronic, and uronic acids liberated from the wood by partial acid hydrolysis.

813.2. Minor Organic Constituents. Extractives

See also Nos. 5011, 5249, 5258.

5051. NAGATA, Y., KITAO, K., and TACHI, I. **[Polarographic studies of the heartwood flavonoids. III. On the sulphite oxidation of dihydroquercetin to quercetin.]** *J. Jap. Wood Res. Soc*. 6 (6), 1960 (233–7). 13 refs. [Jap.jap.e.*e*.] P.R.

Gives the results of polarographic studies on the oxidation of dihydroquercetin to quercetin with sulphite, and on the sulphite cooking of Larch heartwood. It was shown that the oxidation reaction of dihydroquercetin to quercetin in the sulphite solution, proceeds in the first order, and that the higher the sulphite concentration and the lower the ethanol content, the greater is the reaction rate. The average contents of dihydroquercetin and quercetin in the outer and inner layers of the sulphite-cooked specimen were determined polarographically.

5052. HARRIS, E. C. **Kiln and air drying of European Oak: effect on starch depletion and consequent susceptibility to *Lyctus* attack**. *J. Inst. Wood Sci*. No. 7, 1961 (3–14). 12 refs.

The relation between the starch content of the sapwood (s.w.) of hardwoods and susceptibility to attack by *Lyctus* sp. is reviewed with reference to the opinion formerly held that kiln seasoning results in greater retention of starch and, consequently, an increase in *Lyctus* attack. An experiment was carried out with freshly converted one-inch European Oak boards from winter-felled logs, some being air- and others kiln-dried. Results showed that kiln drying gave greater depletion of starch and less subsequent attack by *Lyctus*. Data were obtained indicating that, in the kiln-dried material, the depletion occurred during the early stages of the drying schedule when a moderate temperature (40·5° C.) and a high r.h. were operating. Additional tests with green Oak s.w. discs stored in a saturated atmosphere at various temperatures, showed that the optimum rate of starch depletion occurred at

40–30·5°. These findings are discussed in relation to the seasoning of hardwoods as a whole. The conclusion is reached that no simple distinction can be made between the effects of air and kiln seasoning on starch depletion and *Lyctus* attack without reference to the particular kiln schedule employed. Mild schedules, as used for slow-drying hardwoods, could be expected to favour starch depletion, and higher schedules, as used for the fast-drying hardwoods, to favour starch retention. *From author's summary.*

5053. Rudman, P., and Costa, E. W. B. da. **The causes of natural durability in timber. IV. Variation in the role of toxic extractives in the resistance of durable Eucalypts to decay.** *Holzforschung, Berlin* 15 (1), 1961 (10–5). 3 refs. [E.e.g.] P.R.

[Cf. *F.A.* 21 No. 2360.] Samples from three trees from each of 9 durable Eucalypt species were tested for resistance to decay by *Trametes lilacino-gilva* and *Coniophora cerebella* by both soil-block and soil-sawdust techniques, and the results correlated with density, extractive content, and toxicity of extractives. Decay resistance of the sawdusts was markedly reduced by ether-methanol extraction (except with *Eucalyptus marginata*) and the ether-methanol extractives were highly toxic (except with *E. marginata* and *E. paniculata*) especially to *C. cerebella*. Subsequent extraction with alkali caused a further reduction in decay resistance but, with most species, the fully extracted sawdust was still more resistant to *T. lilacino-gilva* than sawdust from a non-durable timber (*E. regnans*). This residual decay resistance (not shown to any extent against *C. cerebella*) varied strikingly between, but showed little variation within, the species. Decay resistance showed no correlation with basic density and was not greatly affected by gross variation in the end-grain/volume relationship of the blocks, or by conversion of blocks to sawdust. It is concluded that decay resistance in durable Eucalypts is due principally to the toxicity of extractives which are methanol-soluble, although in some species (including *E. marginata*) the toxic extractives are present in a less soluble form. Other secondary sources of decay resistance are considered to be chemical rather than structural in nature. *From authors' summary.*

5054. Takahashi, K., Tanabe, Y., and Fukuyama, T. **[The constituent of the wood of *Hovenia dulcis* Thunberg.]** *J. Pharm. Soc. Japan* 79 (4), 1959 (500–2). 2 refs. [Jap.e.*e*.] O.R.S.

A new dicarboxylic triterpenoid, hovenic acid, $C_{30}H_{46}O_5$, was isolated. Its structure is discussed.

813.3. Ash Constituents

See No. 4178.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

See Nos. 5109–10.

813.7. Odour and Taste

5055. Ghosh, S. S., and Shahi, R. **Taggar wood and its Indian substitute.** *Indian For.* 87 (2), 1961 (119–23 + 9 photos). 16 refs.

A new Indian scented wood sold under the name 'Taggar wood' has been identified as *Hemicyclia porteri*. Its anatomical and other characteristics are described in detail. Distinguishing features of this and other scented woods of the world are discussed with a description of genuine Taggar wood (*Cinnamosma fragrans*) from Madagascar. *From authors' summary.*

813.9. Wood Chemistry: Miscellaneous

5056. Packman, D. F. **The acidity of wood.** *Holzforschung, Berlin* 14 (6), 1960 (178–83). 12 refs. [E.e.g.] P.R.

The acidity of wood of several species was shown to increase during storage under damp conditions. The rate of acid production increased considerably with rises in temperature from normal room temperature to 100° C. By an apparent ability to decompose or neutralize acid as it was produced, certain fungi inhibited the accumulation of acid in the wood at temperatures within their respective ranges of active growth. Free acid produced in a number of commonly used softwoods and hardwoods was identified as acetic acid, and corresponding losses of combined acetyl groups from the woods were measured. Considerable difference in the rate of hydrolysis of acetyl groups was observed between different woods under comparable conditions. *From author's summary.*

5057. Pereles, J. **The acidity of selected Puerto Rican woods.** *Carib. For.* 21 (1/2), 1960 (41–4). 4 refs. [E.]

Lists the pH values of 28 woods cut from mature trees ca. 5 years previously. The range was from 3·4 for a Mango to 5·6 for a Fig. Most woods, however, fell between 4·4 and 5·0.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 5053, 5126, 5164, 5166, 5172.

5058. Zubieta, G. J., Gómez, C. E., and Bonanni, E. O. Durabilidad de postes de madera en líneas aéreas telegráficas. **[The durability of wooden telegraph poles.]** *Foll. téc. Adm. Nac. Bosques, B. Aires* No. 8, 1960. pp. 29 + 4 plates + 1 map. 12 refs. [Span.span.]

In order to study the relationship between climate, type of destructive organism, and durability of timber, Argentina was divided into three broad climatic zones, (1) humid, (2) semi-humid, and (3) dry, and 1,652 specimens from both treated and untreated poles were examined, and are listed, showing species, years of service, types of fungus, insect or other attack, and other general observations. Data are conflated for the following species:—*Astronium balansae*, *A. urundeuva*, *Myroxylon peruiferum*, *Piptadenia excelsa*, *P. macrocarpa*, *Prosopis* spp., *Schinopsis* spp., *Copernicia alba*, *Libocedrus chilensis*, *Araucaria angustifolia* (1) only, *Pinus* spp. (1) only, and *Phyllostylon rhamnoides* (3) only, and their performance in the three climatic types is summarized.

5059. ENGLERTH, G. H. **The service life of untreated posts in Puerto Rico after one year in test.** *Trop. For. Note Trop. For. Res. Cent., Rio Piedras* No. 5, 1960. pp. 2.

Gives tabulated data on tests of 67 species.

5060. BEALS, H. O. **A study of the anatomy and degradation in mid-western pleistocene woods and some of their implications.** *Abstr. of thesis,* in *Dissert. Abstr.* 21 (6), 1960 (1342). O.R.S.

Wood specimens of Pleistocene age, ranging from ca. 5000 years to Yarmouth-age, were identified by macro- and microscopic examination and found to consist largely of coniferous genera. Few angiosperm remains were found. Several coniferous specimens found only in Yarmouth-age deposits were referred to an artificial group called *Larixites*. Unidentified leaf material of a coniferous nature was also found in Yarmouth-age deposits. Degradation of the wood was found to occur in at least three different forms, two of which are also known as defects in modern wood. Frequently associated with each other, these forms have similar appearances in advanced stages, but originate in different ways. Similar processes appear to affect all fossil woods before mineralization.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 4110–2, 4346, 4974, 4997, 5027, 5031, 5090, 5201–2, 5205.

5061. KEITH, C. T. **Characteristics of annual rings in relation to wood quality for White Spruce [*Picea glauca*.]** *For. Prod. J.* 11 (3), 1961 (122–6). 14 refs.

Analysis of cross-sections of 15 relatively large veneer logs indicated consistent positive correlation between growth rate (rings/in.) and specific gravity, whereas a tendency for sp. gr. to increase outward from the centre, independent of ring width, was not observed.

5062. RISI, J., and ZELLER, E. **Specific gravity of the wood of Black Spruce (*Picea mariana* Mill. B.S.P.) grown on a *Hylocomium-Cornus* site type.** *Contr. Fonds Rech. For. Univ. Laval* No. 6, 1960. pp. 70. 102 refs. [E.e.f.]

In 5 trees, 70–80 years old, growing on an area of ca. 1 acre, sp. gr. varied between 0·332 and 0·442 (mean 0·380) g./c.c., with significant differences between individual trees. The influence of height in the tree upon sp. gr. was very small, and not uniform in all trees. The variation in sp. gr. between pith and bark differed in each tree. For the group of trees investigated, no significant relation between ring width and sp. gr. could be detected, but this is not necessarily true for each of the individual trees which, in this respect too, seem to follow rules of their own. *From authors' summary.*

5063. SUNLEY, J. G., and LAVERS, G. M. **Variations in the strength and specific gravity of Sitka Spruce grown in Great Britain.** *J. Inst. Wood Sci.* No. 7, 1961 (15–27).

Sitka Spruce, widely used in afforestation by the Forestry Commission, is known to show considerable variation in quality, and the causes of this are not fully known. Variations in strength and sp. gr. were measured and related to the different geographical regions and site factors. Results indicate that the growth region has a small effect, but large variations occur between trees on the same site, although between-site and within-tree variations cannot be neglected. In addition, the relation between the 'quality class' of the site and the properties is examined and the possibility of using tree girth in estimating timber properties is discussed. *From authors' summary.*

5064. ZOBEL, B. J., *et al.* **Some effects of fertilizers on wood properties of Loblolly Pine.** *Tappi* 44 (3), 1961 (186–92). 16 refs. P.R.

Investigations were made in 1958 into the effects of various fertilizer applications on some wood properties of planted *Pinus taeda* in N. Carolina. Three levels of treatment were assessed, viz. 160–80–80 lb. respectively of N, P_2O_5 and K_2O ("heavy"); 80–40–40 ("moderate"); and none (control), following applications made for 3 consecutive years from 1951 when the trees were 16 years old. Wood was examined for 7 years before, and 7 years after, the first application. Both the heavy and, to a lesser extent, the moderate treatments caused a significant decrease in sp. gr. (up to a max. of 16%). Tracheid lengths and cellulose yields decreased with increased dosage, but the changes were not statistically significant, the large inherent variability and relatively small number of trees per treatment probably accounting for this. The wide degree of individual tree variability existing before, was still evident after, fertilizing, even though mean figures were considerably changed by the treatments, and there appeared to be a large individual tree difference in response to fertilizing, a factor that may become very important in the development of improved tree strains. Determinations of sp. gr., tracheid length, and cellulose yields also indicated some possible differential effects of fertilizer on the individual, depending on its initial wood properties, and these merit further study.

5065. MARKARJANC, V. P. K voprosu o vlijanii vozrasta na stroenie i svojstva drevesiny sosny. **[The effect of age on the structure and properties of Scots Pine wood.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (112–4). 5 refs. [Russ.]

Tabulates data on the m.c. and number of rings in sapwood and heartwood, mean ring width, latewood %, etc. for Scots Pine from even-aged stands of age classes II, III, IV, V, VI and XI, of similar type, site class, etc. in the Krasnoyarsk area of Siberia.

5066. SEKHAR, A. C., and NEGI, G. S. **Studies on variation of strength properties in wood. Variation from pith to periphery across the diameter in a tree.** *Indian For.* 87 (2), 1961 (87–93). 31 refs.

Studies were made on variations from pith to periphery in sp. gr., fibre stress at elastic limit, modulus of rupture, modulus of elasticity, and maximum crushing stress (compression ||) for green wood of *Cedrus deodara*, *Dipterocarpus grandiflorus*, *Machilus macrantha*, *Pinus longifolia*, *Shorea robusta*, and *Tectona grandis*. It was found that, with certain exceptions, strength increased with distance from the pith, but decreased again near the periphery. No significant variation in strength of wood from the north, south, east, and west sides of stems was found.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

5067. Technik und Holzwirtschaft. Messeheft 1961. **[Technology and wood industry. Fair number 1961.]** *Holz-Zbl.* 87 (48), 1961. pp. 215. [G.]

An illustrated preview of the German Industries Fair, Hanover, chiefly of machine tools, with articles on: The [German] woodworking machinery industry (*H. Kraus*); Standard sizes for particle boards (*W. Kull*); Permanent conveyor equipment in the wood industry (*H. R. Müller*); Rotary planes and planing (*W. Elsner*) [including hydraulically fixed cutters]; and Waste wood for heating (*H. Geul*).

5068. TURNBULL, R. F. **Sawmilling developments and research on sawing and finger jointing.** *Aust. Timb. J.* 26 (11), 1960 (61 . . . 69).

A paper presented to the Australian Timber Stabilizing Conference 1960, summarizing the approach adopted in this research and some of the findings for Australian sawmilling.

5069. SANEV, V. I. Rezul′taty teoretičeskogo issledovanija skol′ženija zagotovok v val′covyh organah podači derevoobrabatyvajuščih stankov. **[Results of a theoretical investigation of the sliding of pieces of wood in the roller feed of woodworking machinery.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (97–111). [Russ.]

A detailed investigation in which three possible theories were considered. Results agreed well with those of the experimental part of the work, which will be published later.

821. Barking

5070. SCHNYDER, A. P. **The tunnel barker.** *Pulp Paper Mag. Can.* 62 (3), 1961 (70–3).

Logs are fed lengthwise into a tunnel of steel and reinforced-concrete, in the bottom half of which are situated grill bars and the operating mechanism, consisting of an open scroll with triangular pushers. First, the tunnel is about half filled with logs in a stacked arrangement throughout its length; the pushers move the logs round the tunnel (the lower half of which is lined with abrasion-resistant Emery Crete), and the grill bars and the friction between the logs themselves further assist barking. The bark falls through the grill into a trough or conveyor below. The charge of logs is emptied on a pre-set time schedule. The tunnel has a barking capacity up to 50% greater than that of a barking drum of comparable dimensions. Its chief economic advantage is the saving of usable wood fibres normally lost in drum-barking through brooming of log ends and breakage.

5071. GLÄSER, H. Die Einflüsse der Fällzeit, Lagerungsweise und Vorbehandlung des Fichtenfaserholzes auf den Entrindungsvorgang bei der Nassreibungsentrindung. **[The effect of time of felling, method of storage and pretreatment of Spruce on ease of wet friction barking.]** *Repr.* from *Papier, Darmstadt* 14 (12), 1960 (710–8). 4 refs. [G.g.e.f.]

Spruce felled at monthly intervals from Oct. 1955 to Feb. 1957 was stored in various ways and given various treatments immediately before barking. Resistance of the logs to barking immediately after felling, measured by various tools [cf. *F.A.* 16 Nos. 522–3], was highest in winter and lowest in June, but differences in resistance caused by different felling dates disappeared after a few months' storage. Logs cross-stacked, in the open or under cover, showed increasing resistance to barking and final drum-barking of these logs was difficult. Storage under water or close stacking (all logs stacked in the same direction) reduced barking resistance and facilitated final barking. Steaming the logs in an autoclave, or, to a smaller extent, soaking them in water immediately before drum-barking made barking easier; addition of detergents to the water used for soaking did not affect ease of barking.

822. Saws and Sawing

See also No. 5096.

5072. FIŠKINA, F. L. Nekotorye dopolnenija k teorii ob″emnogo ispol′zovanija pilovočnyh breven. **[On the theory of sawlog volume utilization.]** *Lesn. Ž., Arhangel′sk* 3 (1), 1960 (116–20). [Russ.]

Discusses theoretical and experimental findings which indicate that in producing short blanks ($\leqslant$3 m.) waste is less if unedged boards are broken down directly into short blanks.

5073. BATIN, N. A. Vlijanie širiny postava, količestva par dosok v postave i širiny propila na poleznyj vyhod pilomaterialov pri raspilovke breven vrazval. **[Effect of frame width, the number of pairs of boards in the frame, and kerf width on the useful outturn of sawn timber when [frame-] sawing logs through and through.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (165–8). 1 ref. [Russ.]

A theoretical study, the chief results being shown in graphs.

5074. IVANOV, V. D., and KRUTIKOV, N. S. Ob ėffektivnyh režimah raspilovki breven na lesopil′nyh ramah s vysokimi posylkami. **[Effective schedules for sawing logs in frame saws with high feed speeds.]** *Lesn. Ž., Arhangel′sk* 3 (5), 1960 (115–20). 4 refs. [Russ.]

An analysis of frame-sawing schedules for small logs (14–20 cm. diam.), dealing particularly with the time wasted per shift because of interruptions or hold-ups between logs, and the need for improved conveyor-feed systems to bring the logs to the saws.

5075. FEOKTISTOV, A. E. Ustojčivost′ pil′noj lenty pod vozdejstviem na nee usilija podači. **[Bandsaw strength under the influence of feed forces.]** *Lesn. Ž., Arhangel′sk* 3 (3), 1960 (95–106). 2 refs. [Russ.]

[Cf. *F.A.* 20 Nos. 1031, 5181.] From a theoretical analysis, a formula is developed for the critical feed force; values for the latter are calculated and presented in a table for various blade thicknesses (1, 1·2, and 1·4 mm.), widths (70, 90, 110, and 140 mm.), strains (4, 6, 8, and 10 kg./sq. mm.), and free lengths between the guides (20, 30, 40, 50, and 200 cm.). Experiments were made to verify these theoretical findings. The calculated values proved to be somewhat higher than the experimental ones, as a result of the play between the saw-blade and the guides. With a play of 0·00–0·05 mm., the calculated critical values were 4–8% greater than the experimental ones; with 0·05–0·1 mm. play, 10–20% greater, with 0·15–0·2 mm. play, 15–30% greater; with 0·3 mm. play, 30–70% greater. Strain, in the range investigated, had little effect on strength. The need for guides of a new type (i.e. ones that will automatically regulate the amount of play to keep it within the prescribed limits along the whole width of the blade) is emphasized.

823. Planing. Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

5076. BUHTIJAROV, V. P. O silah "otžima" pri prodol′nom frezerovanii. [**"Thrust" forces in longitudinal spindle-moulding**.] *Lesn. Ž., Arhangel′sk* 2 (3), 1959 (133–42). [Russ.russ.]

According to its direction, the 'normal force' (vertical force component) acting on a cutting blade can be either (*a*) an upward thrust, or (*b*) a downward dragging force. Detailed studies were made on Oak and Scots Pine to determine the effect of blade blunting, feed, and chip thickness on the 'normal force'. With increasing wood hardness and blade blunting, (*a*) tended to increase. With sharp blades, (*b*) occurred. In all cases, increasing chip thickness reduced (*a*). The absolute values of (*a*) and (*b*) are very small, and under certain conditions equal zero.

5077. PIŽURIN, A. A. Vlijanie geometričeskih parametrov rezca na usilija rezanija i čistotu obrabotki pri tangencial′nom točenii drevesiny. [**Effect of the geometrical parameters of the cutter on the cutting force and surface cleanness in tangential turning of wood**.] *Lesn. Ž., Arhangel′sk* 3 (4), 1960 (108–15). 3 refs. [Russ.russ.] [Cf. *F.A.* 22 Nos. 2423, 3662.]

5078. SUZUKI, R. [**The influence of moisture content of wood on the sharpness of cutting edge of [a planer] knife**.] *J. Jap. Wood Res. Soc.* 6 (1), 1960 (1–5). 9 refs. [Jap.jap.e.*e.*] P.R.

Graphed and tabulated data from tests to determine the relationship between the changes occurring in knife sharpness while planing *Chamaecyparis obtusa* and *Cercidiphyllum japonicum*, and the m.c. of the wood, indicated that the smallest change in sharpness generally occurred at ca. 5% m.c.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

See also Nos. 5106–7.

5079. MACK, J. J. **Repetitive loading of nailed timber joints**. *Div. For. Prod. technol. Pap. For. Prod. Aust.* No. 10, 1960. pp. 8 + 2 photos. 2 refs.

Presents results of repetitive loading tests made (in compression) on a number of three-member nailed joints fabricated from green *Eucalyptus marginata* and *E. diversicolor* and both green and dry *Pinus radiata*. Loads selected to cause various amounts of initial slip were applied up to 10,000 times. In all cases, increases in joint slip occurred with increase in magnitude of load and number of repetitions. The joints were generally less stiff after repetitive loading than before, but the ultimate strength was not affected with repetitive loads causing initial slips of ≯ 0·060 in.

824.8. Glues and Gluing

See also Nos. 5012, 5115, 5132.

5080. MOSLEMI, A. A. **Resistance of casein glue joints to shear fatigue stressing**. *For. Prod. J.* 11 (3), 1961 (115–9). 6 refs.

Describes repeated loading tests with stress varying from zero to ultimate stresses between 23 and 83% of mean static shear strength, on a novel type of specimen made up of one horizontal and two vertical pieces of hard Maple glued together so that loading of the central, horizontal piece subjected the glue line to torsion. At 10 million cycles (taken to represent endurance limit), fatigue strength was ca. 600 lb./sq. in. or ca. 25% of mean static strength. Little or no wood failure occurred in either static or fatigue tests.

5081. KONTEK, W., and ŁAWNICZAK, M. Badania nad zastosowaniem żywicy "AG" do klejenia elementów drewnianych. [**The application of "AG" resin in bonding wood assemblies**.] *Prace Inst. Tech. Drewna* 6 (2), 1959 (29–44). 8 refs. [Pol.pol.russ.e.] P.R.

Describes tests made in 1958 at the Zakład Tworzyw Drzewnych (Division of Wood Products) of the Instytut Technologii Drewna, Poznań, on the glue-line strengths of Oak, Ash, Beech, Birch, Scots Pine and Norway Spruce assemblies bonded with the Polish-made phenol-formaldehyde, cold-setting "AG" resin, along with a benzene-sulphonic-acid hardener. Soaking bonded samples in water at 20° C. for 192 hr. decreased the shear resistance (s.r.) of the joints to ca. 11% for the hardwoods. The glue lines of samples kept 12 hr. in boiling water showed considerable decrease in s.r. due largely to the decrease in wood strength through boiling and also probably through the action of the acid hardener used [cf. *F.A.* 20 No. 1062] (though further work to corroborate the latter statement is recommended). The heating of bonded samples at 100° C. for 96 hr. left the wood oven-dry and, mainly through the effect of the first 12 hr. of high-temperature heating, decreased the s.r. of the joint in all cases. Thus, while in practice "AG" resin may be used for bonding members of any of the Polish-grown species tested, the tendency of the glue-line s.r. to decrease to a greater extent for hardwoods than for conifers under the effects of high-temperature drying and of soaking and boiling, is clearly marked.

5082. BERGER, V., and ŠKRIPEŇ, J. **A contribution to the elucidation of the effect of acid hardener on wood in gluing with phenolic glues.** *Transl. For. Prod. Lab. Can.* No. 140, 1961. pp. 9. Transl. from *Drev. Výskum* 4 (1), 1959 (107–20). [See *F.A.* 21 No. 3743.] Limited distribution.

5083. ŻUROWSKI, J. Klejenie drewna spienionym 40-procentowym klejem mocznikowym. [**Wood gluing with 40% foamed urea resin.**] *Prace Inst. Tech. Drewna* 6 (2), 1959 (3–28). [Pol.pol.russ.e.] P.R.

Presents results of laboratory trials with a 40% foamed urea resin (UR) on furniture veneers and improved wood cores; hitherto in Poland mainly 40% unfoamed liquid UR was produced. Satisfactorily economic formulae were devised, giving a foamed UR equal, or even slightly superior, to unfoamed UR in its glue-joint shear resistance; furthermore, no glue percolation in heated veneer boards was observed. As a result, its full-scale commercial application, with the establishment of a suitable code of industrial practice relating to its preparation and use, are recommended.

5084. ŁAWNICZAK, M., and ZENKTELER, M. Wpływ wahań ciśnienia prasowania przy klejeniu drewna metodą "Imperkol" na wytrzymałość spoiny klejowej. [**Effect of fluctuations in pressing pressure on the glue-line strength in bonding wood by the Imperkol method.**] *Prace Inst. Tech. Drewna* 7 (2), 1960 (107–15). 3 refs. [Pol.russ.e.] P.R.

In this method of bonding large assemblies in a hot liquid medium, the normal pressure used is 6 kg./sq. cm. Investigations to show the effect of temporary fluctuations from the normal pressure, or of reduced pressure (4 and 2 kg./sq. cm.), on glue-line strength were made with Scots Pine and with Beech. Pressure fluctuating to 4, 2, or 0 kg./sq. cm. (from the normal 6) reduced glue-line strength by ca. 10, 25 and 50% in Pine and by ca. 2, 10 and 30% in Beech respectively. With initial pressure reduced to 4 or 2 kg./sq. cm., fluctuations below this value reduced glue-line strength even more. Compared with the normal pressure of 6 kg., constant pressure of 4 and 2 kg. reduced glue-line strength values by ca. 30 and 60% in Pine, and by ca. 10 and 40% in Beech.

5085. CHUDZIŃSKI, Z. Badania nad ustaleniem minimalnej długości desek w elementach wielkowymiarowych klejonych metoda "Imperkol". [**Determining the minimum length of boards in large [laminated] members glued by the Imperkol method.**] *Prace Inst. Tech. Drewna* 7 (2), 1960 (61–94). 15 refs. [Pol.russ.e.] P.R.

Investigations to determine the best method of end-jointing boards in laminated assemblies showed that, of the 9 methods investigated and compared with solid wood, the 1/7 scarf joint was the best, both economically and technically. With this, pieces as short as 50 cm. can be used to make the laminated assembly, without apparently reducing its strength. Even the most unfavourable distribution of scarf joints (i.e. immediately above one another) did not significantly reduce the static bending strength of the laminated assembly.

5086. STANGER, A. G. **The compatibility of certain glues and water-borne preservatives used for gluing Radiata Pine.** *Inter. Res. Release (For. Prod.) For. Res. Inst. N.Z. For. Serv.* Jan., 1960. pp. 3.

To study various difficulties encountered in gluing preservative-treated timber in New Zealand, batches of Radiata Pine sapwood were severally pressure-treated with polyborate, Cu-Zn-Cr arsenate and Cu-Cr arsenate (compositions given) to the following retentions: (1) 0·1, (2) 0·2, (3) 0·4, and (4) 0·8 lb./cu. ft. The material was then conditioned to a 12% nominal equilibrium m.c. and machined a few hours before gluing with (*a*) a urea-formaldehyde [U.F.], (*b*) a melamine-fortified U.F., and (*c*) a resorcinol formaldehyde, all used without extenders. Test pieces prepared with each glue/preservative-retention combination, plus matched non-treated, glued specimens, were subjected to cleavage tests, the load at failure being a numerical measure of bond strength (b.s.). No evidence of any reduction of immediate b.s. was found, and neither the failing loads nor the nature of the fractures was affected, microscopic examination of the glue lines revealing no defects attributable to the preservatives. Only slight differences in the mean b.s. of the glue lines were observed for the three preservatives used, and it was concluded that, with any of them, adequate immediate b.s. is attainable provided that: (1) at the time of gluing, m.c. of the timber is 11–14%; (2) the timber surfaces are freshly machined just before gluing and free from contamination; (3) the makers' instructions are strictly followed in preparing and applying the glues. Since incompatibility effects appear specific to given combinations of materials, no inferences were possible as to the properties of other combinations, or whether b.s. might be adversely affected by exposure conditions or with passage of time.

825. Cleaving. Adzing. Mechanical Comminution

See No. 5221.

827. Bending. Moulding (other than by Cutting)

5087. HUHRJANSKAJA, T. P. Deformacija i usilie pri torcovom gnut'e drevesiny. [**Deformation and stress in end-grain bending of wood.**] *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (131–7). 6 refs. [Russ.]

[Cf. *F.A.* 20 No. 2485.] Graphs the relation of the deformation and the bending moment to the thickness of the wood strip and to the radius of the curve into which it is bent. Diagrams are presented of the deformation of Birch wood in end-grain bending, and equations are developed for the necessary bending moment, and for the power necessary to perform the bending operation.

5088. DVINJANINOV, D. V. Nekotorye voprosy odnoosnogo pressovanija drevesiny. [**Some problems in compressing wood in a single direction.**] *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (121–30). [Russ.]

Studies the deformations and internal stresses occurring when wood is compressed in a single direction, particularly the phenomena of wood shearing under these conditions. It is concluded that shearing of wood in compression is caused by the deflection of the horizontal elements; this is due chiefly to the friction between the wood and the walls of the pressing mould. These shearing actions can be diminished by reducing the wood/wall friction coefficients. Some experimental moulds incorporating such a reduction are described and illustrated. These have the added advantage that the compressed wood produced in them is of much more uniform density than that from normal moulds.

829.1. Finishing

See also Nos. 5012, 5173, 5195, 5203.

5089. Osyka, G. D. Šlifoval′nyj instrument novogo tipa. [**A new type of smoothing tool.**] *Derev. Prom.* 9 (9), 1960 (13–4). [Russ.] P.R.

The new tool, developed at the Lvov Forest Technology Institute, is designed to replace conventional sanders, and consists of a solid rubber drum, 32 cm. in diam. and 25 cm. high, into which have been vulcanized steel wires 0·2 mm. in diam., arranged radially 0·5–1 mm. apart. Before work, the surface of the tool is rubbed over with an emery wheel so that the ends of the wires project 0·1–0·2 mm. from the surface of the rubber. The amount of wood removed, and the working life of the tool, depend on the hardness of the rubber and on the re-sharpening schedule. It is estimated that one such tool, of hard rubber, can replace ca. 800 sq. m. of abrasive paper.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

See also No. 4968.

831. Fuelwood and Various Types of Rough Timber

See also Nos. 5058–9, 5126, 5128–9, 5135, 5142, 5145–51.

5090. Stebnicka, E. Przydatność posuszowego drewna sosnowego do wyrobu kopalniaków. [**Suitability of dead Scots Pine for the manufacture of pitprops.**] *Prace Inst. Tech. Drewna* 7 (3), 1960 (29–50). 13 refs. [Pol.russ.e.] P.R.

Pitprops were made from trees in an 80-year stand, site class III, of the fresh Pine forest type, using (*a*) healthy trees, and (*b*) trees killed by *Myelophilus piniperda* but with wood undamaged by insects or fungi. During storage from autumn to the following spring, insect and fungus attack was much worse in (*b*) props. Compression strength tests, and investigation of the audible warning given by the props before failure, indicated no differences of practical significance between (*a*) and (*b*) material, but in view of the susceptibility of (*b*) material to insect and fungal damage, its use as pitprops is deprecated.

5091. Biliński, A. Pomiary podporności obudowy drewnianej ścian. [**Measurements of the [compression] strength of timber pitprops.**] *Przegląd Górniczy*, [*Katowice*] 1958 (9), (13–7). [Pol.] From *abstr.* in *Polish tech. Abstr.* No. 4 (36), 1959 (6172). [E.Russ.] P.R.

The average load of $\ngtr$ 11–14 metric tons supported by individual props near the coal face was found to increase by 2–3 tons after coal-cutting and subsequent roof subsidence of ca. 5 cm. Failure finally occurred when the props were compressed to ca. 88–90% of their original height. Curves are plotted illustrating the loads on the props and the movement of the roof, and the mechanical properties of the props are described.

5092. Sekhar, A. C., Sachar, S. S., and Lal, P. **Recent work on testing of wood poles.** *Indian For. Bull.* (*n.s.*) No. 224, 1960. pp. 29. 20 refs.

Explains methods used for testing the strength of poles at Dehra Dun and gives tabulated results of tests on *Pinus wallichiana*, *P. longifolia*, *Shorea robusta* and *Terminalia tomentosa*.

5093. Harder, H. **Wood poles for overhead transmission lines. Assessment of the stability of wood poles in cases of decay.** New Zealand Forest Service, Wellington. 1960. pp. 11. P.R.

Translation of a booklet originally published in German (with the original text appended) [see *F.A.* 20 No. 1094].

5094. Lella, E. F. di. Maderas aptas para el abastecimiento de durmientes en la República Argentina. [**Timbers suitable for providing sleepers in Argentina.**] *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 11, 1960. pp. 3 + 1 tbl. 3 refs. [Span.span.]

Reviews the position in Argentina as regards the supply of sleepers, and lists, with data on their properties, suitable species, (1) not needing, and (2) needing, preservative treatment, with the regions where they are to be found. It is suggested that non-tannin-producing species should be preferred.

5095. García, R. R. El quebracho blanco en la elaboración de durmientes. [**Quebracho Blanco in the manufacture of railway sleepers.**] *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 10, 1960. pp. 6. [Span.span.]

Presents notes on *Aspidosperma quebracho-blanco* and its distribution in Argentina, with data on the physical and mechanical properties of the wood, with a view to estimating its suitability for sleepers. The strength values, although not high in relation to sp. gr., are satisfactory, and the wood takes preservatives easily. Shrinkage values are high for moisture contents $>15\%$, so that initial drying must be slow in order to avoid seasoning defects.

832. Mills, Their Functions and Products

See also No. 4903.

832.1. Sawmills and Planing Mills

See also Nos. 4905, 4968–9, 5067 *et seq.*

5096. Lier, B. Savværkstekniske produktionsundersøgelser i Norge. [**Sawmill production studies in Norway.**] *Træindustrien* 10 (11), 1960 (120–31). [Nor.] P.R.

The types of sawmill studied, as being characteristic of Norwegian production, were: mill with two circular-saw benches, one as headsaw and one as resaw; mill with circular headsaw, resaw and edger; mill with log-edger, cant splitter, resaw, slab edger and slab resaw (all circular saws); and mill with twin frame-saws and edger; flow-lines are illustrated diagrammatically. Differences in output within and between types and in costs between types are discussed and shown in graphs.

5097. Nylinder, P. Om justermånens längd hos sågtimmer. [**Trimming allowances for saw-timber.**] *Uppsats. Instn. Virskeslära K. Skogshögsk., Stockh.* No. *R*29, 1961. pp. 13 + 9. [Sw.sw.e.]

A study on ca. 5000 boards from squares of Spruce and Pine suggested that the most economic allowance for trim on logs of both species, i.e. the one that would ensure a minimum of sound timber being lost when trimming boards in standard export lengths in full feet + 1 in., was 6 in., and the most uneconomic one, 2 in. Allowances at present prescribed are 3 in. for land-transported timber and 4 in. for floated.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 4533, 4973, 5023, 5080 *et seq.*, 5115, 5132, 5211.

5098. Lella, E. F. di. Características de las especies forestales aptas para compensados. [**Characteristics of forest species suitable for plywood.**] *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 9, 1960. pp. 7 + 1 plate. 3 refs. [Span.]

Discusses the physical and mechanical properties, figure and grain, of timber suitable for plywood, and lists 22 species already so used in Argentina. A further 13 are recommended for trial, with brief notes on their individual characteristics and properties.

5099. **Veneer drying.** *Tech. Note For. Prod. Res. Inst., Philippines* No. 9, 1960. pp. 4. 6 refs. P.R.

Research at Laguna has shown that the large differences in required drying time among Philippine species are attributable much more to differences in green m.c. than to differences in drying rate. It was also found that doubling the veneer thickness increased the required drying time by a mean factor of ca. 2·7 for all the species tested to date.

5100. Boksberg, I. P., and Domanskaja, Z. B. Ispytanija kleenoj fanery na izgib v ploskosti sloev. [**Testing glued plywood by bending in the plane of the plies.**] *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (105–7). [Russ.]

Tests were made in the plane of the plies (instead of ⊥ to them), using 9-ply Birch plywood 10 mm. thick, glued with bakelite film. Four different types of test piece were investigated, and results (tabulated) show how bending strength varies with the size and shape of the test piece. It is concluded that the influence of the absolute dimensions of the test piece is comparatively small, and that test pieces with a span of 240 mm. and a depth of 20 mm. are perfectly satisfactory.

5101. Kontek, W., Bauza, J., and Nowak, K. Z badań nad fizycznymi i mechanicznymi własnościami płyt stolarskich listewkowych. [**Tests on the physical and mechanical properties of blockboards.**] *Prace Inst. Tech. Drewna* 7 (2), 1960 (27–44). 5 refs. [Pol.russ.e.] P.R.

Blockboards were made of Scots Pine core-strips 25 mm. square, a urea glue, and face veneers of: (*a*) Alder 2·4 mm. thick; (*b*), as (*a*) on a Poplar base 1 mm. thick; and (*c*) hardboard 3·7 mm. thick. The annual rings of the core-strips were oriented (1) perpendicular, (2) parallel, and (3) obliquely (45°), to the surface veneers. This orientation of the grain did not affect sp. gr., swelling and shrinkage, or glue-line shear strength, but did affect static bending strength, which was greatest with (1) and least with (2). Boards faced with (*c*) had lower shrinkage and swelling, better dimensional stability, and greater static bending strength than those faced with (*a*) or (*b*).

5102. Krpan, J. Čvrstoća lijepljenja stolarskih ploča. [**Glue-line strength of blockboards.**] *Drvna Ind.* 12 (1/2), 1961 (11–5). [Sloven.g.] P.R.

Blockboards 22 mm. thick were made with 3-mm. veneers (Poplar or steamed Beech) and 16 × 25 mm. core-strips (Silver Fir or Poplar), using a urea-formaldehyde glue. Water content and glue-line strength were determined (*a*) air-dry, (*b*) after 48 and (*c*) after 96 hours in cold water. Boards with Poplar veneers proved water-resistant, but those with Beech veneers had a glue-line strength <10 kg./sq. cm. after (*c*). The mean of glue-line strength of all the samples was 21·9, 11·9 and 11·4 kg./sq. cm. for (*a*), (*b*) and (*c*) respectively. Glue-line strength for (*a*) was considerably greater in boards with Poplar than in those with Fir cores.

5103. Krpan, J. Vergleichende Untersuchungen der physikalischen und mechanischen Eigenschaften von Tischlerplatten. [**Comparative investigations of the physical and mechanical properties of blockboards.**] *Holz Roh- u. Werkstoff* 19 (1), 1961 (27–30). [G.g.e.] P.R.

Reports more extensive tests on the same blockboards [see preceding abstr.]. With Poplar core-strips, it was found that board density, static and impact bending strength, and compression strength were greater, and water absorption, thickness swelling, and Brinell hardness less, than with Fir core-strips. Boards with Poplar veneers absorbed less water than those with steamed Beech veneers.

5104. **Production standards for structural glued laminated timber**. Timber Development Association, London. [1960?] pp. 24. P.R.

The standards presented apply to the manufacture of structural components from separate pieces of timber arranged as laminations ∥ to the axis of the member, the individual pieces being assembled with the grain roughly ∥, and glued together to form a member which functions as a single structural unit. They do not apply to stressed-skin constructions or plywood box-beams.

5105. Dorn, H., and Egner, K. Brandversuche mit geleimten Holzbauteilen (Hetzer-Balken). [**Fire**

testing of laminated constructional components.] *Holz-Zbl.* 87 (28), 1961 (435–8). [G.g.]

In standard tests, involving exposure to maximum temperatures of 850° C. for 30 minutes, beams of 16 × 40 cm. cross-section built up of Spruce or Silver-Fir boards glued with 4 glues (resorcinol- or urea-formaldehyde basis) retained >twice the minimum permissible loading strength, but after 1 hour with temperatures up to 1000°, only half of it. Beams of narrower cross-section lost more strength. Cohesion was retained in all cases. Loss of weight in 30-min. tests was ca. 6·5 kg./sq. m. of surface, loss of width ca. 3·4, and loss of depth ca. 3·8 cm., independent of cross-section.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

5106. GREIM, W. Dritter Erfahrungsbericht über den Holzstahlbau. **[Practical experience with wood/steel constructions. Third report.]** *Holz-Zbl.* 87 (6), 1961 (69–71). 2 refs. [G.g.]

[Cf. *F.A.* 19 No. 4889.] Describes German tests with varying numbers and thicknesses of steel strips and sizes of nails, which confirmed the excellent strength properties of these joints.

5107. BORG, G. Holzbauwerke mit Eisenarmierung. **[Wooden constructions reinforced with [sheet] iron.]** *Holz-Zbl.* 87 (44), 1961 (665–6). [G.]

Describes composite trellis beams, consisting of two stringers connected by diagonal braces forming a zigzag pattern. The braces are built up of two or more layers of wood alternating with one or more strips of 1·5-mm. sheet-iron, nailed together. The sheet-iron strips protrude from the ends of the braces, forming lugs which are fitted into slits cut into the stringers and nailed fast. [Cf. preceding abstr.]

5108. **Design tables for timber beams and columns.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 271, 1961 (2–7). 1 ref.

Presents a brief and complementary arrangement, in tabular form, of data already published at length on several Australian strength groups, covering the stiffness and load-carrying capacities of beams and columns of various sizes and lengths. [See *F.A.* 20 No. 2423.]

833.3. Special Uses in Factories and Workplaces

See also No. 5169.

5109. DOST, W. A. **Certification of Redwood and effect of oxidizing agents on Redwood in cooling tower service.** [*Paper*,] *20th Annual Water Conference, Pittsburgh, Penn.* 1959. pp. 6. P.R.

Outlines the conditions in which Redwood has an economic service life in cooling towers, with suggestions for avoiding the deleterious effects of oxidizing agents in the circulating water.

5110. **Non-oxidizing chemicals protect cooling towers.** *Repr.* from *Maintenance* June, 1960. pp. 1. P.R.

From the results of a performance check covering 15 years (from 1943) made on a Redwood cooling tower at Freeport, Texas, it was found that non-oxidizing chemicals such as PCP-Na, or commercial formulations containing blended chlorophenates as the main ingredients, are superior to all other chemicals, including Cl, used in the past to control algae and slime. The main advantages of PCP-Na over Cl are: lower net cost; greater thoroughness in action; and actual surface protection for wood as compared with the delignification hazard of Cl. It was concluded that, circulated in the water at 80 p.p.m., either PCP-Na or commercially formulated products containing blended chlorophenates may be used with successful biocidal results.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

5111. BAĐUN, S. Iskorišćenje sirovine u industrijskoj proizvodnji bačava. **[The utilization of raw materials in industrial barrel production.]** *Drvna Ind.* 12 (1/2), 1961 (16–21). 5 refs. [Croat.e.] P.R.

The degree of wood utilization and waste was determined for each of 6 barrels (of ca. 600–750 litres) made from 1·244 cu. m. of Oak blanks for the staves, and 0·454 cu. m. for the ends. The %s of wood wasted in the various manufacturing processes (grooving, bevelling, jointing, cutting to length, planing, making the bung-hole, etc.) were determined and are tabulated in detail. Total utilization of the raw material for the staves ranged from 48·53 to 54·59%, and for the ends from 59·31 to 67·95%; mean total utilization was 54·71%.

5112. NETHERCOTE, C. H. **The selection and use of wood in protective packing.** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 17, 1960. pp. 16.

Discusses various problems arising in the selection and use of Canadian timbers in making shooks, pallets, crates, and other containers, with reference to the following main factors: compatibility of species and contents; wood groups; weight; defects in timber moisture content (effect of m.c. changes on strength, weight, contents etc.); joints; preservative treatments; water repellents.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also Nos. 5003, 5023.

5113. REHMAN, M. A., and GUPTA, P. G. **Timber for pencil slats, its conversion, seasoning and treatment.** *J. Timb. Dryers' Pres. Ass. India* 7 (1), 1961 (20–6 + 2 photos). 4 refs.

Briefly traces the history of the pencil industry in Germany, Britain, and the U.S.A., mentioning the properties required for making slats and the main timbers used (particularly *Juniperus virginiana*, *J. barbadensis*, *J. procera* and *Libocedrus decurrens*) and describing the American method of conversion, seasoning, and treatment. Relating this experience to the development of the pencil industry in India, suggestions are made for the establishment of the pencil-slat industry there, stressing especially the suitability of such Indian species as *Cedrus deodara* and *Cupressus torulosa*. [Cf. *F.A.* 15 No. 788.]

5114. Zieger, E. Untersuchungen über äussere Merkmale, Holzeigenschaften und forstgeographische Vorkommen der Resonanzholzqualitäten bei Fichte und einigen anderen Holzarten. **[External characteristics, wood properties and regional distribution of Spruce and other species producing resonance wood.]** *Mitt. StForstverw. Bayerns* No. 31, 1960 (285–98). 6 refs. [G.]

A lecture, based on literature, the author's own investigations, and information gathered from instrument makers, discussing the scarcity of suitable Spruce, particularly in E. Germany, substitutes (e.g. Firs and Pines), size considerations, density, ring structure, branching habit etc., and stressing the desirability of growing high-quality Spruce.

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See No. 5201.

838. Vehicles (including Ships, Boats, Aircraft)

5115. Starkiewicz, H. Nowe metody formowania krzywych elementów szkutniczych. **[New methods of assembling curved [laminated] members for marine craft.]** *Prace Inst. Tech. Drewna* 6 (2), 1959 (59–76). 6 refs. [Pol.pol.russ.e.] P.R.

Describes three methods of assembly, (i) trapezoidal, (ii) diagonal, and (iii) combined, developed for studies made in 1956 at the Instytut Technologii Drewna Poznań, on the mechanical properties of curved laminated members (50 × 50 × 650 mm.; 1160 mm. diam. curve) bonded with a cold-setting phenol-formaldehyde glue. Satisfactory properties were revealed, and good economic results obtained, for each method.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 5067, 5230.

5116. Corder, S. E., and Scott, T. **Size of particles from saws and planers at mills in the Willamette Valley [, Oregon].** *Rep. (For. Prod. Res.) Ore. For. Res. Cent.* No. G.-7, 1960. pp. 15.

Since new and improved uses of sawdust and shavings may depend on the size distribution of particles, this was studied in residues from various types of saw and planer in 1954–55. Test data are presented with a discussion of variables affecting particle size.

5117. Bollen, W. B., and Glennie, D. W. **Sawdust, bark and other wood wastes for soil conditioning and mulching.** *For. Prod. J.* 11 (1), 1961 (38–46). 32 refs.

A discussion of the fundamental factors involved, based largely on U.S. literature, with some additional information on representative wood residues, including enriched and processed substances, and descriptions of some commercial products.

5118. Webster, G. R. **The effect of sawdust, straw, compost and manure on the yield and chemical composition of strawberries and on soil moisture, acidity and organic matter content.** *Canad. J. Pl. Sci.* 41 (1), 1961 (42–9). 19 refs. O.R.E.

Sawdust mulch and sawdust incorporation, the former being slightly better, produced highly significant increases in yield over controls, and were superior to all other treatments tested.

5119. Kirsch, R. K. **Effect of sawdust mulches. I. Soil properties.** *Tech. Bull. Ore. Agric. Exp. Sta.* No. 49, 1959. pp. 16. 9 refs.

When Douglas Fir sawdust was applied with or without fertilizers as a mulch or soil amendment, strawberries became infested with red-stele disease [cf. *F.A.* 16 No. 2309]. Soil samples were taken after rotovating all plots, and sweet corn was planted to determine residual effects. The results of analyses are presented. A further study of the effect of Douglas Fir and Alder sawdust on certain physical soil properties is summarized.

5120. Roberts, A. N., and Mellenthin, W. M. **Effects of sawdust mulches. II. Horticultural crops.** *Tech. Bull. Ore. Agric. Exp. Sta.* No. 50, 1959. pp. 34. 64 refs.

[Cf. *F.A.* 16 No. 4643.] Summarizes experiments over an 8-year period on the effect of Douglas Fir and Alder sawdust, Oak leaves, and straw, used as mulches and soil amendments, on: yield of certain horticultural crops; incidence of red-stele disease of strawberries; and fertilizer requirements (particularly N) as measured by crop response.

5121. Mason, D. C. **Slabwood bundling and rafting techniques.** *Timber of Canada* 22 (2), 1961 (23–6, 28, 30, 70).

Tabulates in detail results of pilot experiments leading to commercial operations, e.g. the towing for 150 miles of a raft containing 2900 bundles of hand barked, 8-ft., air-dry Jack Pine slabwood. In the raft the bundles averaged 0·795 stacked cords, of which 97% plus some loose wood arrived in excellent condition. The best type of bundle (other types tried in round brackets) had a volume of ¾ cord (½ and 1 cord); flat straps (round); 2 wraps (1 and 3); straps 1¼ × 0·035 in. (¾ in.); and manual tensioning (power-tool tensioning).

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

5122. Ille, R. [Editor]. Konservace dřeva. **[Wood preservation.]** Statní Nakladatelství Technické Literatury, Prague. 1958. pp. 375. Many refs. [Cz.] P.R.

Contains chapters by different contributors dealing with the main aspects of wood preservation, describing various conventional methods of treatment for fungus and insect control, resistance to physical and chemical agencies, fire resistance, steaming, drying etc.

841. Wood Preservation

See also Nos. 5012, 5014, 5058, 5084–6, 5112, 5157, 5160–2, 5169.

5123. **Record of the 1959 Annual Convention of the British Wood Preserving Association, Cambridge, June 30th–July 3rd, 1959.** *Rec. 1959 Conv. Brit. Wood Pres. Ass.* 1959. pp. ix + 194. Many refs.

Contains the following papers, with individual discussions of each and a final summing-up: The influence of soft rot on the susceptibility of Beech to attack by *Anobium punctatum* (*J. D. Bletchly*; pp. 5–15) [see *F.A.* 21 No. 1126]; The fine structure of wood with special reference to timber impregnation (*R. D. Preston*; pp. 31–57) [see *F.A.* 21 No. 2439]; The American Wood-preservers' Association and some recent developments in the wood-preserving industry (*J. M. Gurd*; pp. 73–84); Boron as a wood preservative (*D. R. Carr*; pp. 105–22) [see *F.A.* 21 No. 1084]; Further studies on the composition of wood preserving creosote (*D. McNeil*; pp. 136–50); Some forest pests (*E. H. B. Boulton*; pp. 163–72); An interpretation of the trends in the production of treated wood and in the use of wood preservatives in the United States—1953–1958 (*R. H. Colley*; pp. 174–80).

5124. BRUCE, W. E. **Timber preservation in Britain. General survey of recent developments.** *Timb. Tr. J.* 237 (4414), 1961 (66, 68).

[Cf. *F.A.* 14 No. 1622.] Covers roughly the past 30 years, including data on number and types of plant, consumption of preservatives, standards, glue compatibility, testing, and need for legislation.

5125. BENITO MARTÍNEZ, J. Estado actual de la industria española de impregnación de maderas, con un apéndice sobre normas para redactar el anteproyecto de un taller de inyección por el sistema Rüping. **[Present state of the wood preservation industry in Spain, with an appendix giving standards for drawing up plans of a plant for pressure treatment by the Rüping process.]** Instituto Forestal de Investigaciones y Experiencias, Madrid. 1960. pp. 72 + 31 plates. 106 refs. [Span.]

Presents a compilation of data on the present state of the preservation industry in Spain, including information on timbers used and the most important natural agencies responsible for their destruction, preservatives and processes currently used, existing plants, and economic aspects of the industry. The appendix gives detailed information, with specifications and diagrams, to be used in planning a plant of the type stated.

5126. FOUGEROUSSE, M. Propos sur quelques problèmes de préservation du bois. **[Some problems of wood preservation.]** *Bois For. Trop.* No. 75, 1961 (46–63). [F.e.span.]

Some of the questions discussed are protection of wood in contact with tropical soils (particularly sleepers and poles), means of protection against marine borers, and the value of osmotic-diffusion processes for treating tropical timbers. A table shows natural durability, uses for which preservative treatment is advisable, and fitness for impregnation, of 74 West African species.

5127. MADHOSINGH, C. **Tolerance of some fungi to a water-soluble preservative and its components.** *For. Prod. J.* 11 (1), 1961 (20–2).

To elucidate a possible interaction of *Coprinus micaceus* and *Fusarium oxysporum*, found to be associated on decayed Birch and Poplar fence posts treated with a mixture of fungicides, the mixture (34% NaF, 34% $K_2Cr_2O_7$, 25% Na arsenate, and 7% 2,4-dinitrophenol) and various combinations of its components, were tested *in vitro* against the two fungi and also against *Polyporus adustus* and *Lenzites saepiaria*. *F. oxysporum* was the most tolerant to the whole mixture and to most of its components, and *C. micaceus* the most sensitive. It is suggested that *F. oxysporum*, a ubiquitous soil saprophyte, may enter the treated posts and in some way reduce the toxicity of the preservative so that the entry and spread of the wood-decaying *C. micaceus* is facilitated. Thus it is thought that decay of the treated posts was due to complementary action by the two organisms. In some cases interactions of chemicals occurred, a mixture being less toxic than its components. DNP was the most potent fungicidal and fungistatic agent.

5128. ŠALTYKO, G. E. O pričinah bystrogo gnienija drevesiny, propitannoj slancevym špalopropitočnym maslom. **[Reasons for the rapid decay of wood in sleepers impregnated with shale oil.]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (127–30). 4 refs. [Russ.]

Examination of sleepers on 12 electrified lines in the U.S.S.R. revealed that those impregnated with (*a*) shale oil decayed much faster than those impregnated with (*b*) coal-tar oil, and even faster than unimpregnated sleepers. In laboratory experiments, sapwood samples of Scots Pine impregnated with (*a*) and with (*b*) were subjected to attack by *Coniophora cerebella* and *Merulius lacrymans*, leaching, and water absorption. It was found that preservative doses ensuring protection had to be ca. 3 times as high for (*a*) as for (*b*), with both fungi. Leaching occurred 13–14 times faster, and water absorption was 8–9 times greater in wood impregnated with (*a*). It is therefore concluded that (*a*) should not be used alone as a preservative for outside work.

5129. BORUP, L. **A comparison between creosote oil and Swedish salt preservatives K33 and KP.** *Timb. Technol.* 69 (2260; 2261), 1961 (53–5; 95–8).

From a general survey of experience in Sweden, compares the effectiveness of K33 (a mixture of As_2O_5, CrO_3, and CuO) and KP (Cu and chlorophenol in an aqueous solution of ammoniac [NH_4Cl?] and H_2CO_3) with that of creosote, for sleeper preservation. Impregnation problems, moisture conditions, electrical conductivity, corrosion, cracks, hygiene, disposal of worn-out sleepers, and economics are discussed. The preservative effect of K33 was roughly equal to that of creosote, whereas KP was somewhat inferior. Impregnation with these salts was less complex, but creosoted sleepers absorbed less moisture and corroded metal less. Where Pine is the main sleeper wood, there seems to be no point in changing from the traditional creosote. Where Beech or other hardwoods are used, or where creosote is expensive, salt preservatives may be preferred.

5130. GOLDSTEIN, I. S., DREHER, W. H., and JEROSKI, E. B. **Preservative action of bound copper and zinc.** *For. Prod. J.* 11 (3), 1961 (128–30). 16 refs.

In soil-block tests on Southern Yellow Pine sapwood impregnated with various concentrations of $CuSO_4$ and $ZnCl_2$, 1·5 and 7% Cu acetate solutions, 10% Zn acetate solution, and 1·2 and 0·6% Cu formate solutions, half the acetate and Cu-formate blocks being subjected to artificial weathering, lower retentions of Cu and Zn in the form of sulphate or chloride, than of acetate, were needed to protect the wood against decay. Binding the metal ions to the wood structure with acetate made them less toxic to fungi.

5131. PETRI, V. N., and FOKINA, A. G. Novye kombinirovannye antiseptiki dlja drevesiny. [**New combined preservatives for wood.**] *Derev. Prom.* 9 (8), 1960 (14–5). [Russ.] P.R.

Briefly reports work comparing the preservative effect of Na_2SiF_6 alone and in 4/1 mixture (by weight) with each of the following: KBr, $CuCl_2$, $CuSO_4$, $FeCl_3$, $FeSO_4$, and $ZnCl_2$. The methods of treatment investigated were: (*a*) under vacuum; (*b*) hot and cold baths; (*c*) diffusion from a paste. Against house fungi, e.g. *Merulius lacrymans*, both in the laboratory and under practical conditions, all 6 additives increased the preservative effect of Na_2SiF_6.

5132. **Plant operators' manual of recommended practice.** Borax Consolidated Ltd., Borax House, Carlisle Place, London, S.W.1. 1960. pp. 44 + 2 tbls., many drawings. P.R.

Intended as a guide to the operator carrying out preservative treatment, the manual sets out recommendations based on research originally done in Australian and N.Z. Government laboratories and also on long and varied commercial experience in the preservation of timber with boron compounds, under the following main sections: (1) Specifications, with a schedule of net dry-salt retentions; (2) General information on "TimBor" preservative powder, e.g.: its composition and supply, permanence and leaching, effect on wood strength, gluing etc.; (3) "TimBor" solutions, i.e. recommended working solution strengths, surface area per cu. ft., and pick-up per standard, preparation, sapstain; (4) Treatment by diffusion process, with details of the factors affecting diffusion by (*a*) momentary dipping, and (*b*) spray-tunnel application, and of diffusion storage, with reference to the drying and gluing of treated veneers; (5) Treatment by pressure impregnation, outlining the general requirements for treatment schedules for sawn timbers and plywoods, with a classification of permeability; (6) Inspection, describing tests to determine depth of penetration, plant control, and the keeping of treatment records.

5133. GRIFFITHS, R. J., and COCKROFT, R. **Neutron absorption estimation of boron preservatives in timber.** *J. Inst. Wood Sci.* No. 7, 1961 (73–7). 9 refs.

B is used in the preservation of green timber by diffusion methods which may become increasingly important as more home-grown timber is introduced on to the market. Quantitative analyses of B in timber by the measurement of neutron absorption were shown to be more accurate and less time-consuming than other methods. Results of measurements on treated Corsican Pine samples in the A.E.R.E. research reactor 'Gleep' show that 1% B preservative (expressed as boric acid) can be detected in wood to ⅓% accuracy by this method, and the feasibility of a cheaper but less accurate laboratory bench method is demonstrated. *From authors' summary.*

5134. BAVENDAMM, W., PREUSSER, H.-J., and WILLEITNER, H. Die Oberflächenverteilung von Schutzmittelkristallen auf trockenem Holz. [**The superficial distribution of preservative crystals on dry wood.**] *Repr.* from *Naturwissenschaften* 47 (18), 1960 (426–7). 2 refs. [G.]

Presents briefly the results (to be published in detail elsewhere) of studies on the size and number of crystals of KHF_2 on the radial surface of small samples of Pine sapwood soaked for a short time in a 5% aqueous solution of the preservative.

5135. GEWECKE, H. **Sap as solvent for impregnating salts in the impregnation of poles by the open tank, pressure and pile suction processes.** New Zealand Forest Service, Wellington. 1960. pp. 2. Transl. from *Holz Roh- u. Werkstoff* 15 (10), 1957 (416–7). [See *F.A.* 20 No. 5241.] Limited distribution. P.R.

The original German text is appended.

5136. SHIBAMOTO, T., and INOU(Y)E, Y. [**Studies on water-borne wood preservatives. XIX. Test result of chemicals against attack by fungi and insects. XX. Antifungal effect of wood preservatives.**] *J. Jap. Wood Res. Soc.* 6 (5), 1960 (177–93). 10 refs. [Jap.jap.e.*e*.] P.R.

Tabulates the results of tests made to assess the effectiveness of various chemical methods of controlling attack by *Coptotermes formosanus*, *Dinoderus minutus*, *Penicillium citrinum*, *Poria vaporaria* and *Aspergillus flavus* in Japanese Cedar, Lauan, and Ramin test blocks and plywood.

5137. SHIBAMOTO, T., and INOU(Y)E, Y. [**Studies on water-borne wood preservatives. (XIII.) Synthesis of fixtan acids, their derivatives and their critical micell concentration in aqueous solution. (XIV.) Solubilized wood preservatives.**] *J. Jap. Wood Res. Soc.* 6 (1), 1960 (11–5, 29–33). 19 refs. [Jap.jap.e.*e*.] P.R.

Presents, in tables and graphs, data showing the penetration of various water-insoluble preservatives (4,6-dinitro-*p*-cresol, PCP, Cu pentachlorophenate, and dieldrin) solubilized with a surfactant (polyoxyethylene alkylamine). These proved more stable than emulsion systems, a high degree of leaching resistance being recorded in weathering tests.

5138. Walters, C. S., and Côté, W. A., Jr. **The distribution of pentachlorophenol in the microstructure of Basswood.** *Holzforschung, Berlin* 14 (6), 1960 (183–9). 6 refs. [E.e.g.] P.R.

[Cf. *F.A.* 20 No. 5245.] Electron-microscope investigations were made on *Tilia americana* samples, some after treatment with PCP. It was found, *inter alia*, that when green wood was treated with PCP solutions containing water-miscible solvents, the toxicant was deposited in the cell-wall capillaries as a result of an interchange of water between the wood and the preservative solution. When oven-dry or solvent-seasoned wood was treated with PCP solutions containing water-miscible or water-immiscible solvents, the toxicant penetrated the gross wood structure but the treating liquids did not penetrate the cell-wall capillaries.

5139. Becker, G. Voraussetzungen einer Güteüberprüfung von Holzschutzarbeiten. [**Quality control of wood preservation work.**] *Holz-Zbl.* 86 (155), 1960 (2195–7). 49 refs. [G.]

Discusses briefly, on the basis of (mainly German) literature, the testing of preservative treatment of building timbers, by dipping, brushing, or spraying, as to uniformity and depth of penetration, retention, and the influence of the chief factors involved, e.g. timber species, properties and condition, the passage of time. Graphs showing the great variability of penetration and retention, and of the relations of these to each other, both in the laboratory and in practice are presented. It is thought necessary to analyse $\nless 20$ samples from one normal practical job to obtain reliable mean values.

5140. Small, D. **A creosoting plant at Thetford Chase.** *For. Rec. For. Comm., Lond.* No. 44, 1960. pp. 27. Price 2*s*. 6*d*.

The empty-cell, open-tank process in use at this plant in Suffolk, England, is described in detail, together with lay-out, conveyor system etc.

5141. Chiani, R. G. Ensayos exploratorios sobre tratamientos sin presión en madera de "lenga" y "coihue". [**Preliminary trials in the treatment, without pressure, of Lenga and Coihue.**] *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 6, 1960. pp. 3. 2 refs. [Span.]

Experiments in the preservation of *N. pumilio* and *N. dombeyi* by (1) immersion (*a*) hot and (*b*) cold, (2) osmosis (*a*) hot and (*b*) cold, and (3) injection, showed that none of these methods gave satisfactory retention of preservatives; 2 (*a*) gave the best results and might warrant further investigation.

5142. Chiani, R. G. Tratamientos sin presión para postes telefónicos, telegráficos, y para alambrados, varillas, varillones, redondos y rodrigones, que se aplican a maderas de escasa resisténcia a la putrefacción, tales como "eucaliptos", "álamos", "sauces", "casuarinas", "plátanos", "coihue", "lenga", "palma", etc. [**Non-pressure treatments for telegraph and telephone poles, fence posts, cross bars, rods, round timber, and stakes, suitable for non-durable species such as Eucalypts, Poplars, Willows, *Casuarina cunninghamiana*, *Platanus acerifolia*, *Nothofagus dombeyi*, *N. pumilio*, *Copernicia alba* etc.**] *Misc. for. Adm. Nac. Bosques, B. Aires* No. 2, 1960. pp. 5. 2 refs. [Span.]

Gives brief information on (1) hot and cold bath (2) osmose, and (3) Boucherie processes.

5143. Bavendamm, W., and Sczesny, W. **Investigations on the practical application of the hot-cold bath process for the impregnation of building timber.** New Zealand Forest Service, Wellington. 1960. pp. 5. 11 refs. Transl. from *Holz Roh- u. Werkstoff* 15 (9), 1957 (381–4). [See *F.A.* 20 No. 3835.] P.R.

The original German text is appended.

5144. Verrall, A. F. **Brush, dip, and soak treatments with water-repellent preservatives.** *For. Prod. J.* 11 (1), 1961 (23–6). 8 refs.

Presents results of 18 years' exposure testing, in Mississippi, of exterior woodwork, chiefly of Southern Pine, suggesting that cold soaks of $\geqslant 30$ minutes give good protection to wood off the ground subject to high decay hazard from seepage. PCP, and Cu naphthenate are at least equal to other preparations. Painting greatly increased the effect of preservatives, particularly of short dips and brush coats. [Cf. *F.A.* 21 No. 5013.]

5145. Kollmann, F. Die Eigenschaftsänderungen von Grubenholz nach Schutzsalzimprägnierung. [**Changes in the properties of mine timber after impregnation with preservative salts.**] *Forschungsbericht des Landes Nordrhein-Westfalen, Düsseldorf* No. 698, 1959. pp. 94. 26 refs. [G.g.] P.R.

Samples of Pine and Spruce were impregnated with aqueous solutions of 7 preservative salts (against decay and/or combustibility) in such a way as to achieve maximum uptake of the solution. Tests showed that: impregnation had no significant effect on the moduli of elasticity; but tensile strength was significantly reduced, and there were no warning noises during tension before fracture; compression strength was increased in Pine heartwood and especially in Spruce, but was reduced in Pine sapwood; deformation in compression loading was increased considerably; bending strength was reduced and warning noises during compression were reduced or disappeared completely; the wood also became much more brittle. Tests on small pitprops after normal impregnation treatment, however, showed that: differences between the breaking strength in compression of impregnated and non-impregnated pieces were fortuitous; warning noises were not influenced by impregnation. Investigations on physical properties, anatomy and fire behaviour showed *inter alia* that: impregnation increased the sp. gr. of the wood (most in Spruce, less in Pine sapwood, and least in Pine heartwood); sorption behaviour was virtually unaffected by impregnation in the range 0–60% r.h., but above 60%, increases in the equilibrium m.c. were encountered; the higher the concentration of the salt solution, the better the fire resistance; impregnation deprived wood of its property of being a relatively good electrical insulator at normal r.h. *From author's summary.*

5146. Zyska, B., Koszorek, I., and Czech, O. Obserwacje nad trwałościa drewna impregnowanego i neimpregnowanego w kopalniach węgla kamiennego. **[Observations on the behaviour of impregnated and non-impregnated timber in coal mines.]** *Przegląd Górniczy, [Katowice]* 1958 (4), (5–8). [Pol.] From *abstr.* in *Polish tech. Abstr.* No. 2 (34), 1959 (5899). [E.Russ.] P.R.

Presents detailed graphical and tabular results of observations made on the behaviour of impregnated vs. non-impregnated timber [unspecified] at different air humidities and temperatures in the ventilation galleries of mines in Upper Silesia. For economic and technical reasons it was found necessary, when air humidity was >85%, to impregnate timber for all-wooden and mixed timber supports in galleries intended for >6–12 months' use, as well as that used for filling steel arch supports in galleries intended for >4–6 months' use.

5147. Stronge, J. S. **Two methods of preserving native timber for posts. Trials carried out in Taranaki.** *Farm For., Wellington* 2 (2), 1960 (28–32).

The two methods tested (on a number of native New Zealand species as well as some exotics) were (*a*) sap replacement using Bolit salts, and (*b*) diffusion with Osmosar salts. Results are tabulated. The most satisfactory combinations were (*a*) for *Knightia excelsa*, *Cupressus lawsoniana*, and *Fuchsia excorticata*, and (*b*) *C. lawsoniana*, *Robinia pseudoacacia*, *K. excelsa* and *Dysoxylum spectabile*.

5148. **New standard for treated fence posts aims at life expectancy of more than 30 years.** *Wood Pres. News* 39 (2), 1961 (12, 14). P.R.

A new Commercial Standard, CS235–61, for pressure-treated wood fence posts (with oil-type preservatives), issued by the U.S. Department of Commerce, became effective from 6 Feb. 1961. It provides the minimum specifications and requirements for wood species, dimensions and tolerances, manufacturing methods, wood preservatives, and the pressure-treatment of round, half-round, and square-sawn wood fence posts of the types and sizes in general demand. Definitions of trade terms are listed, and a means of marking each post and certifying each shipment of posts complying with this standard are explained. This voluntary trade standard is based on actual service tests made by the U.S. Forest Service in co-operation with the industry, and posts treated to comply with it may be expected to last >30 years.

5149. Olson, A. R. **Highway post survey: a 1960 progress report.** *Circ. Conn. Agric. Exp. Sta.* No. 217, 1961. pp. 16.

[Cf. *F.A.* 17 No. 4503.] Results in general confirm earlier findings. Red Pine posts cold-soaked in PCP have been in service only for 10 years, but the absence of failure due to decay indicates good service life.

5150. Englerth, G. H. **Service life of some Puerto Rican post species tested with ten percent pentachlorophenol by cold soaking.** *Carib. For.* 21 (1/2), 1960 (38–40). 1 ref. [E.]

The estimated life, number decayed, and number unserviceable at 8 years, and preservative absorption are reported for 21 species tried at Cambalache and 15 at Toro Negro. Cold soaking for 120 hours was the treatment.

5151. Purushotham, A., *et al.* **Interim note on the behaviour of experimental Sal sleepers treated with creosote and Ascu by Wood Preservation Branch, Forest Research Institute [Dehra Dun], and laid on the main lines of the North Eastern railway at Mathura and Mailani in 1940.** *J. Timb. Dryers' Pres. Ass. India* 7 (1), 1961 (2–19). 5 refs. P.R.

Describes and classifies the mechanical and biological deterioration occurring in preservative-treated Sal [*Shorea robusta*] sapwood and untreated heartwood sleepers as observed in six inspections made between 1941 and 1959 at two localities, Mathura (dry) and Mailani (wet). On the basis of the tabulated data presented, details are given of the various treatments recommended for optimum service life.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies

See also Nos. 5032, 5088.

5152. Stamm, A. J. **Modified woods. Laminates, vulcanized fiber and resin-wood products.** *Rep. U.S. For. Prod. Lab., Madison* No. 2192, 1960. pp. 22 + 4 photos, 1 tbl. 47 refs. P.R.

Essentially a review in which the author considers the various chemical, thermal, and compression treatments used to improve wood, most of which are directed towards increasing its dimensional stability under varying temperature and humidity [cf. *F.A.* 8 No. 1895; 9 No. 2370; 11 No. 1217]. Some of these involve permeating the wood with synthetic resin-forming chemicals, one consists in forming a cellulose derivative of the type used in plastics; another utilizes the plastic properties of lignin; and others, though the materials they employ have no more plastic properties than the original wood, form cross-linkages of the type sought in plastics.

5153. Sadoh, T., Araki, M., and Goto, T. **[Studies on the dimensional stabilization of wood. VIII. Hygroscopicities of formaldehyde-treated wood.]** *J. Jap. Wood Res. Soc.* 6 (6), 1960 (242–6). 7 refs. [Jap.jap.e.*e*.] P.R.

Discusses results of a study of the hygroscopic behaviour of 0·2-mm. × 1·0-cm. × 5-cm. samples of formaldehyde-treated *Chamaecyparis obtusa* and *Betula nikoensis*, with reference to the mechanism of dimensional stabilization. The graphical data presented indicate that over the whole r.h. range studied, the equilibrium m.c.'s of treated samples were lower than those of untreated ones, the anti-moisture-adsorption efficiency tending to increase with higher r.h.

5154. OGARKOV, B. I., and KONDRATOV, L. I. Issledovanie pročnosti pressovannoj drevesiny sosny pri sžatii pod uglom k voloknam. **[Investigation of the strength of compressed Scots Pine wood in compression at an angle to the grain.]** *Derev. Prom.* 9 (7), 1960 (11–3). [Russ.] P.R.

Samples 2 × 2 × 3 cm. were prepared from radially compressed blocks of wood, in such a manner that their largest face was parallel to the radial (1), tangential (2), or end-grain (3) plane on the original blocks. The samples were cut so that the force applied in compression tests acted at angles of 0–90°, measured with respect to the grain in (1) and (2), and to the annual rings in (3). Results are graphed. In (1), minimum strength was at an angle of 45°; in (2) maximum at 0° and minimum at 90°; in (3) minimum at 30–40°. Deformation and failure are discussed, and the point is made that, for certain uses of compressed wood, it will be necessary to verify the shear strength in the plane of lowest resistance, i.e. the tangential plane.

843. Fireproofing and Fire Resistance

See No. 5145.

844. Attack by Plant Organisms

See also Nos. 5110, 5234.

844.1. Sap-staining and Mould Fungi

See also No. 4736.

5155. WINQVIST, T. Ett lagringsförsök med obarkad sulfitved. **[A storage trial with unbarked sulphite pulpwood.]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. *R*24, 1959. pp. 24. 6 refs. [Sw.sw.e.]

A study of Spruce pulpwood felled at varying dates and stored for various periods, mainly in roadside stacks, at lat. 61°N. Machine barking of winter-felled wood (1) was quite satisfactory until early September, and of summer-felled wood (2) until the following spring, but became difficult after longer storage. Decay in (1) was slight until August and in (2) until the following spring, but became increasingly severe thereafter. (1) had dried 10% only by August and little thereafter, (2) ca. 20% up to the following autumn. When stored after barking, (1) developed more decay and bluestain on dry land than under water. There was hardly any bluestain in unbarked wood but considerable bark-beetle attack, on which spraying with Seravin-T in May had little effect. [Cf. *F.A.* 19 No. 4925.]

5156. GLASER, T., TAROCIŃSKI, E., and BAUZA, J. Badania nad wzajemnym oddzialywaniem na siebia grzyba *Discula brunneo-tingens* H. Meyer i najwazniejszych grzybów towarzyszącyh mu w procesie kawowo-brunatnego przebarwiania sosnowego drewna tartacznego. **[Study of the interaction of *D. brunneo-tingens* and the most important fungi accompanying it in the coffee-brown discoloration of Pine sawlogs.]** *Prace Inst. Tech. Drewna* 6 (2), 1959 (45–58). 9 refs. [Pol.pol.russ.e.] P.R.

[Cf. *F.A.* 20 No. 1153.] Presents the results of a study of the interaction of *D. brunneo-tingens* (*D*), *Stereum sanguinolentum* (*S*), and *Trichoderma lignorum* (*T*). Three methods of investigation were employed: (1) Simultaneous inoculation of the fungi in pairs was made on a malt-agar culture medium, and their development observed. (2) Results were recorded of the mean 24-hr. growth rates of the mycelium of each fungus on malt-agar media previously used for the other species. (3) Wood samples infected with each species were subjected to the action of the other two, and the macroscopic appearance of, and weight losses occurring in, the samples were observed. The growth of (*D*) and (*S*) simultaneously introduced into the culture medium was arrested by the presence of (*T*), which also overgrew and fruited upon them. All fungi displayed greatly declining growth rates on culture media containing the basic exchange products of preceding fungi, with the exception of (*T*) on the medium previously used for (*S*). The sterilization of wood samples infected with any one species had no inhibiting effect on the subsequent activity of the other species. The presence of live (*T*) mycelium did not prevent slight discoloration by (*D*), but did prevent decay by (*S*), whereas wood infected with live (*D*) mycelium was not protected from the activity of the other two species. The presence of live (*S*) mycelium in wood prevented discoloration by (*D*) but failed to inhibit the development and fruiting of (*T*).

5157. FAULKNER, F. E. **Sapstain an aid in the barking and treating of Macrocarpa.** *Farm For., Wellington* 2 (3), 1960 (53–4).

The difficulty of treating *Cupressus macrocarpa* posts etc. by cold soaking in creosote can be largely overcome by felling in autumn or winter and leaving to season with bark intact until midsummer. 'Sapstain', a grey mould, forms under the bark, and renders the sapwood porous. At the end of the summer the posts are barked, stacked, and allowed to dry quickly, and can then be cold-soaked with much improved retention. [Cf. *F.A.* 19 No. 1070.]

5158. YAMAMOTO, W., and MAEDA, M. **[The effect of some fungicides on the moulds occurring on Bamboos.]** *Repr.* from *Science Reports of Hyogo University of Agriculture, Hyogo (Agricultural Biology Series)* 4 (1), 1959 (23–34). 5 refs. [Jap. jap.e.] I.M.I.

In tests with 29 species (including 9 *Aspergillus*, 11 *Penicillium*, 3 *Cladosporium* and 2 *Fusarium*) isolated from stained bamboos, all mycelial growth and spore germination were inhibited *in vitro* by San Ni Ho (bis tributyl tin oxide 5%) (*a*) at a concentration of 0·002%, Mertan (PMF 5%) (*b*) at 0·005% and Ruberon (ethyl mercuric phosphate 2·5%) at 0·002%, some fungi being inhibited by much smaller amounts (e.g. *Scopulariopsis sphaerosperma* by 0·00025% of (*a*). Soaks (15 min.) killed all fungi on inoculated bamboo slats at concentrations of 0·04% of (*a*) and 0·01% of (*b*), and prevented spore germination and mycelial growth, after subsequent inoculation, at 0·01% (*a*) and 0·008% (*b*).

5159. ROBINSON, R. C. **Blue stain of bark-beetle-infested Lodgepole Pine.** *Bi-m. Progr. Rep. For. Biol. Div. Dep. For. Can.* 17 (1), 1961 (3–4).

Studies are in progress to identify the stain fungi accompanying barkbeetle attack in British Columbia and to determine the mode of their introduction. Preliminary results suggest that a complex of fungi is involved, and that barkbeetles serve as vectors. *Ceratocystis montia* and two yeasts made up the majority of cultures from barkbeetles, and *C. montia* was always associated with one or other, and often both, of the two yeasts. Another stain fungus, apparently a species of *Leptographium*, was occasionally isolated, and its perfect stage, thought to be a species of *Ceratocystis*, has been obtained in the laboratory. The same 4 organisms were isolated from bluestained wood, but in different frequencies, *Leptographium* sp. being obtained about twice as often as *C. montia*. [Cf. Rumbold, *F.A.* 3 p. 247.]

5160. Hartigan, D., and Truman, R. **Application of chemicals to living trees as a possible means of preventing the growth of blue stain fungi**. *Aust. Timb. J.* 26 (12), 1961 (85, 87, 91, 93). 3 refs.

Tabulates the unpromising results, 20 months later, of treating *Pinus radiata*, on girdles or in frills, with various concentrations of Pentapine, PCP, polyborchlorate, Keotised mercury A.S., Shirlan W.S., 2,4,5-T and 2,4-D amine salts, Amizol, Endothal, and MH-diethanolamine salt. Na arsenite (40% in water) treatment was abandoned at first inspection as apparently encouraging bluestain. The means by which the hoped-for reduction was to be effected were (*a*) bark loosening and rapid drying, (*b*) slow kill to reduce starch, (*c*) systemic action toxic to fungi.

5161. Sandermann, W., *et al.* Studien auf dem Gebiete der Holzschutzchemie. 9. Mitteilung. Untersuchungen über ölige Bläueschutzmittel. **[Studies in the field of wood preservation chemistry. IX. Investigations on oily preservatives against bluestain.]** *Holzforsch. u. Holzverwert.* 10 (4), 1958 (57–66). 20 refs. [G.g.e.] P.R.

[Cf. *F.A.* 20 No. 2453.] Reports on the evaporation of commonly used bluestain preservatives, and on the synthesis and effectiveness of new preservatives. Testing for evaporation in an incubator at 60° C was found to give valuable information on the comparative effectiveness of bluestain preservatives. Chloronaphthalene was particularly volatile. The best results were obtained with salicylanilide and phenylmercuric acetate, though even these compounds exhibited noticeable evaporation. PCP showed a clear loss in weight. Of the new compounds synthesized, only some of the *p*-chlorobenzylidene-aniline class were active against bluestain, but these were of no practical interest because of their volatility. Compounds formed by heat treatment from PCP (viz. benzylidene chloride and octachloro-diphenyleneoxide) were ineffective against bluestain. A synthetic tetrachloro diphenylene oxide was very toxic to man and beast. Amino derivatives of PCP are still being tested.

5162. Sandermann, W., and Casten, R. Studien auf dem Gebiet der Holzschutzchemie. 10. Mitteilung: Über die Prüfung von Bläueschutzmitteln. **[Studies in the field of wood preservation chemistry. X. Testing preservatives against bluestain.]** *Holz Roh- u. Werkstoff* 19 (1), 1961 (20–1). 3 refs. [G.g.e.] P.R.

Describes a variant of the Hann.-Münden test method [see *F.A.* 14 No. 1649], in which grooved samples are used, the inoculum is applied in and between the grooves, and the preservative is applied on the other (ungrooved) surface. Many preservatives hitherto considered effective, were found by the new test method not to be so.

844.2. Wood-destroying Fungi

See also Nos. 4623, 4720 *et seq.*, 5045, 5053, 5093, 5123, 5127–8, 5130–1, 5136, 5155–6, 5245.

5163. Singh, S., Singh, B., and Bakshi, B. K. **Fungus flora of South Andamans**. *Indian For.* 87 (4), 1961 (248–50 + 1 plate). 1 ref.

Lists 42 wood-rotting fungi, with an indication of hosts and type of rot caused.

5164. Clark, J. W. **Natural decay resistance of Alerce [*Fitzroya cupressoides*.]** *For. Prod. J.* 11 (3), 1961 (127–8). 6 refs.

In standard soil-block tests on samples from 12 trees, mean weight losses with *Poria monticola* were 20% and with *Lenzites trabea* 11%, putting the wood in the 'resistant' class (i.e. less durable than the "very resistant" Redwood or Western Redcedar). The range of values (9–33% and 3–20% respectively) was relatively small for woods of this class. On the limited material, resistance could not be correlated with density, site, rings/in. or colour.

5165. Bekša, G. N. Vlijanie gribnyh poraženij na fiziko-mehaničeskie svojstva drevesiny buka vostočnogo. **[Effect of fungal attack on the physical and mechanical properties of the wood of *Fagus orientalis*.]** *Lesn. Ž., Arhangel'sk* 3 (1), 1960 (121–6). 5 refs. [Russ.]

Sound Beech wood, and wood in various stages of decay, were tested, and their density, compression ||, static and impact bending strength, and hardness, determined. Results are tabulated, and show that wood in the incipient stages of decay can be used for commercial purposes if it is properly dry-stored.

5166. Bakshi, B. K., *et al.* **A note on decay resistance of Teak, Shisham and Khair**. *Indian For.* 87 (1), 1961 (40–1).

Samples of all 3 species were tested with agar cultures of 4 different fungi. Samples of Semul (*Bombax malabaricum*), a very perishable timber, were also tested for comparison. *Acacia catechu* (*a*), *Dalbergia sissoo* (*b*), and *Tectona grandis* (*c*), were found to be highly resistant, resistant, and moderately resistant respectively. The relatively low resistance of (*c*) was apparently due to the immaturity of the sample tree. The outer heartwood was relatively more decay-resistant than the inner in both (*b*) and (*c*). There appeared to be no difference in decay resistance at different heights in any species. Sapwood of (*b*) had low decay resistance compared with Semul. The sapwood and inner heartwood of (*c*) belonged to the same decay-resistance class.

5167. PETRI, V. N., and BELENKOV, D. A. Èksperimental'noe opredelenie optimal'noj vlažnosti drevesiny dlja plenčatogo domovogo griba (*Coniophora cerebella* Sch.). **[Experimental determination of the optimum moisture content of wood for *C. cerebella*.]** *Lesn. Ž., Arhangel'sk* 3 (5), 1960 (138–42). 6 refs. [Russ.]

Scots Pine sapwood samples at 10·6 and 200% m.c. were subjected to attack by the fungus for 80 days, their m.c. and weight being determined at intervals of 20 days. Results indicated that the activity of the fungus changed the wood m.c. considerably, and that the fungus could adjust m.c. to a range optimum for itself (46·3 ± 3·56% m.c.).

5168. **Wet rot or cellar rot.** *Adv. Serv. Leafl. Timb. Developm. Ass., Lond.* No. 4, 1960. pp. 1. P.R.

Details of the occurrence, particularly in floor boards, and the effects of *Coniophora cerebella*, with brief suggestions for remedial treatment.

5169. WALTERS, N. E. M. **Soft rot in timbers. Part I. What is soft rot? Part II. Methods of control.** *For. Prod. Newslett. C.S.I.R.O. Aust.* Nos. 273 & 274, 1961 (1–2; 1–2).

(I). Briefly outlines the nature of soft rot (illustrated photomicrographically), and describes and discusses the conditions most favourable to its occurrence. (II). Discusses the factors to be considered in controlling soft rot in cooling towers. Among chemical methods considered satisfactory, in theory at least, are the addition of NaPCP or Na-phenylphenate to the water in a tower, though these measures could well prove less satisfactory in practice, through spray hazard (if the tower is located immediately to windward of dwellings or grazing stock), the difficulty of disposing of effluents containing these substances, or the rapid loss of salts due to high water loss, etc. The application of preservative to the slats of cooling towers by the double-diffusion process appears very promising, and it is hoped that further information on the behaviour of various species and of this and other preservative treatments for cooling towers will soon be available.

845. Attack by Animals

845.1. Marine Borers

See also No. 5126.

5170. NAGABHUSANAM, R. **Effect of changes in the hydrogen-ion concentration on the survival of *Martesia striata* Linn.** *Sci. & Cult.* 27 (3), 1961 (151–2). E.M.B.

When experimentally exposed at 28·3°–32·7° C. to pH of 6·0 to 8·6, all *Martesia* were active at the end of 30 days. When exposed to pH of 2·8, 3·7, 4·0, 5·5, 9·7 and 11·0, the corresponding days of survival were 2, 5, 13, 20, 20 and 14. [Cf. *F.A.* 18 No. 1070.]

5171. ELTRINGHAM, S. K. **Wood-boring activity of *Limnoria* (Isopoda) in relation to oxygen tension.** *Nature, Lond.* 190 (4775), 1961 (512–3). 11 refs.

It was observed that *Limnoria* (*L. lignorum*, *L. quadripunctata*, and *L. tripunctata*) leave their burrows in stagnant sea-water, and this reaction has been made the basis of an experiment to evaluate the effect of O tension on boring activity. The possibility was also considered that changes in the pH of the water, caused by the decomposition of organic matter on the wood, were responsible for the evacuation of the burrows. The results of the experiment showed that desertion of the wood by *Limnoria* was accompanied by progressive reduction in the O content of the water. There was little variation in the pH (8·0–7·6) during the experiment, and this can have had little effect. It is, therefore, a reasonable assumption that the exodus of the *Limnoria* was caused by a fall in O tension, and it is suggested that if the O dissolved in the water at the surface of submerged timber falls to a level <2% (e.g. as a result of pollution), the boring activity of *Limnoria* within the wood will cease. *L. quadripunctata* appeared to be more sensitive than the other species to low O concentrations.

5172. WATSON, C. J. J. **Forest Products Research Notes. Project Q.P.8. Studies in marine organisms attacking timber. The effect of stream flow on salinity and destruction of Turpentine [*Syncarpia laurifolia*] piling by marine borers in the Brisbane River.** *Res. Note Qd. For. Serv.* No. 6, 1957. pp. 28 + 2 gphs., 2 dgms. 5 refs. Limited distribution.

S. laurifolia is highly resistant to all marine borers except *Nausitora queenslandica*, which destroys all known unprotected timbers, but is restricted to waters of relatively low salinity.

5173. CRISP, D. J., and AUSTIN, A. P. **The action of copper in antifouling paints.** *Ann. appl. Biol.* 48 (4), 1960 (787–99). 6 refs. O.R.E.

Experiments have shown that the presence of Cu does not deter barnacle cyprids from attempting to settle. Cu-oxide paints do not inhibit settlement appreciably, their efficiency as antifouling agents being due to the toxic action of Cu on cyprids and young spat after initial attachment.

845.2. Terrestrial Borers

See also Nos. 5052, 5123, 5136, 5155.

5174. FOUGEROUSSE, M. Les différents types de piqûres d'insectes pouvant se rencontrer dans les bois tropicaux importés. **[The different types of insect holes that may occur in imported tropical timbers.]** *Note Tech. Centre Tech. For. Trop.* No. 4, 1960. pp. 7 + 6 photos. [F.]

5175. **Timber pests of new houses.** *Adv. Serv. Leafl. Timb. Developm. Ass., Lond.* No. 3, 1960. pp. 2. P.R.

Includes a description and details of the habits of *Ernobius mollis*, which feeds on the bark and immediately underlying sapwood of joists and rafters, together with suggested simple remedial measures. The most simple and effective control measure is to ensure removal of all bark before erection.

5176. **The house longhorn beetle [*Hylotrupes bajulus*].** *Leafl. For. Prod. Res., Lond.* No. 14 (rev.) 1958. pp. 7. 11 refs. Price 1*s*.

Deals with occurrence in Great Britain and methods of control. [Cf. *F.A.* 21 No. 2479.]

5177. Storch, K., and Deppenmeier. Entrinden des Nadelholzes im Wald? **[Should one bark softwoods in the forest?]** *Holz-Zbl.* 87 (37), 1961 (579–81). 6 refs. [G.]

Various concentrations of 5 preparations [not named] diluted in water or diesel oil and sprayed on to Spruce logs at various times from April to July, prevented or greatly reduced barkbeetle attack for 10–14 weeks. The estimated cost, DM.80/cu. m., was less than the difference between hand barking on the felling site and machine barking at the mill, and the saving in man-hours was even greater.

5178. McBride, C. F., and Kinghorn, J. M. **Lumber degrade caused by ambrosia beetles.** *B.C. Lumberm.* 44 (7), 1960 (40 . . . 52). 4 refs.

Further study [cf. *F.A.* 12 No. 3055; 18 No. 4712] in milling 73 Douglas Fir and 47 Western Hemlock logs infested with ambrosia beetles showed average degrade losses, by WCLA list 15, of $5.25 and, by export list "R", of $7.80 per 1000 bd. ft. Degrade was greatest in good, and only slight in poor-quality logs. Only 1% of the entrance holes were due to *Gnathotrichus sulcatus*, *Trypodendron lineatum* being responsible for most of the damage. Holes going deeper than 1·5 in. numbered 1% in the Fir and 65% in the Hemlock.

5179. Francia, F. C. **Studies on the control of ambrosia beetles which damage newly cut timber.** *Repr.* from *Lumberman, Philippines* 6 (2), 1958. pp. 4. 2 refs. P.R.

An account of spray control measures (using several well known commercial insecticides) recommended for the protection of newly cut, barked *Parashorea plicata* logs against ambrosia-beetle attack in the Philippines.

5180. Roonwal, M. L., Chatterjee, P. N., and Thapa, R. S. **Results of experiments on the anti-borer protection of two species of timber, *Salai* and *Bijasal*, by means of insecticides.** *Indian For. Bull.* (*n.s.*) No. 228, 1960. pp. 4.

Experiments with billets and planks of *Boswellia serrata* and *Pterocarpus marsupium*, sprayed with (1) DDT, (2) BHC, and (3) coal-tar creosote, and stacked out of doors, showed that (3) (either alone or with fuel oil) gave no protection against powder-post beetles, but (1) and (2) gave moderate protection.

5181. Santoro, F. H. Persistencia de tres insecticidas clorados pincelados en maderas. **[The persistence of three insecticidal Cl compounds when painted on to wood.]** *Notas tecnol. for. Adm. Nac. Bosques, B. Aires* No. 5, 1960. pp. 6. [Span.]

Trials were made to investigate the persistence of the effects of DDT, dieldrin, and BHC, applied to the cut surface of wood, and their insecticidal action on 15 species of Coleoptera that attack forest products. The woods tested were *Casuarina* sp., *Cedrela balansae*, *Gleditsia amorphoides*, *Fagara coco*, *Juglans australis*, and *Tipuana tipu*. Results are tabulated. Dieldrin at 5% kept its residual action for 64 months and at 2·5% for 18 months; DDT at 5% for 26 months. For BHC the values were: 10% (5% γ isomer)—10 months; 5·5% (2·5% γ isomer)—7½ months; 1·3% (0·6% γ isomer)—6 months.

845.3. Termites

See also No. 5136.

5182. Sylvester, N. K., and Goodship, G. **The toxicity of methyl bromide to dry wood termites.** *Extr.* from *Pest Infestation Research, London 1959*, 1960 (35). P.R.

Preliminary tests were made at 25° C. and 80–90% r.h., using 7 mg./litre of MeBr, on the fumigation of 4 × ½-in. cylindrical wire gauze cages, containing 10 nymphs and/or workers, capped at each end and partly filled with crumbled wood. After fumigation, the contents of the cages were transferred to 4 × 1-in. specimen tubes with gauze tops, to facilitate subsequent observation. The results obtained suggested that the three species of termite tested, *Zootermopsis angusticollis*, *Kalotermes jouteli* and *Reticulitermes lucifugus santonensis*, were very susceptible to MeBr, a concentration-time product of 63 mg./litre/hr. giving 100% kill in all samples.

847. Drying (Seasoning)

See also Nos. 5009–10, 5013, 5028, 5033, 5052, 5099, 5113, 5204.

5183. Millet, R. S. **Wood seasoning.** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 20, 1961. pp. 23. 2 refs.

Treated under the following main heads: (I) Theory of seasoning, including seasoning practice. (II) Seasoning stresses in wood and their determination, including causes and prevention.

5184. Stevens, W. C., and Johnston, D. D. **The seasoning properties of home-grown Sitka Spruce.** *J. Inst. Wood Sci.* No. 7, 1961 (28–33).

In a series of tests recently undertaken at the Forest Products Research Laboratory in co-operation with the Forestry Commission, the seasoning properties of British-grown Sitka Spruce were examined with particular reference to the regions and sites from which the material was obtained. It was shown that this material does not tend to split or check when drying, even at high temperatures and low humidities, but does tend to twist. A very severe drying schedule was finally recommended. Statistical analysis of the data failed to show differences of any significance between the final quality of the dried material from the six regions sampled, but they indicated a highly significant difference in seasoning properties between material from different sites and also from different trees. *From authors' summary.*

5185. McMillen, J. M. **News and views of this kiln drying business. Can American Elm be dried without excessive warping?** *Rep. U.S. For. Prod. Lab., Madison* No. 1769–26, 1960. pp. 3. 5 refs. P.R.

5186. Smith, H. H., and Dittman, J. R. **The segregation of White Fir for kiln drying.** *Res. Note*

Pacif. Sthwest. For. Range Exp. Sta. No. 167, 1960. pp. 6. 1 ref.

Reports on a study of the present method of sorting White Fir (*Abies concolor* and *A. magnifica*) into 3 sorts (cork, sap, and sinker), with particular reference to the correct placing of individual boards containing 2–3 types of wood.

5187. SMITH, H. H., and DITTMAN, J. R. **Drying rate of White Fir by segregations.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 168, 1960. pp. 10.

The object of the study was to determine the green m.c. of each segregation, and the drying time of each, using commercially acceptable drying schedules. Methods of reducing drying degrade were examined. [Cf. preceding abstract.]

5188. MCMAHON, E. P. **Applying cumulative frequency distribution in moisture control during kiln drying.** *For. Prod. J.* 11 (3), 1961 (133–8).

Describes the application of the statistical technique of cumulative frequency distributions plotted on log-normal probability paper (where a normal distribution gives a straight line) to moisture variations in lumber before, during and after drying.

5189. SALAMON, M. **Air circulation in dry kilns.** *Repr.* from *Proceedings, Western Dry Kiln Clubs, Missoula, Mont.* 1960. pp. 6.

Eleven industrial kilns were studied, and a basis for comparison worked out by developing coefficients that can be applied to any kiln to indicate their strong and weak points. The efficiency of the circulating air, the cooling properties of kilns and the effective power consumption of fans were also determined.

5190. NOHARA, M. **[Intermittent drying operation in the dry kiln.]** *Wood Ind., Tokyo* 15 (12), 1960 (14–8). 8 refs. [Jap.e.*e.*] P.R.

Describes experiments made to compare the drying rates, shrinkage, set, and costs arising from the kiln-drying of 50-cm.-long boards of *Fagus crenata* and *Shorea* sp. by (1) continuous (12-hr.) and (2) intermittent (*a*) 12-, (*b*) 8-hr., processes. Graphed and tabulated results indicate that the drying rate was greater for (1) than (2); and that shrinkage was greatest for (1) and least for (2*b*), minimum shrinkage for a moisture decrease of 1% being commonly found between 20 and 25% m.c. Drying costs were least for (2*b*).

5191. VINOGRADSKIJ, V. F. Skorostnaja vakuumnaja suška drevesiny v pole tokov vysokoj častoty. **[Rapid vacuum drying of wood in a high-frequency field.]** *Derev. Prom.* 9 (7), 1960 (7–8). 4 refs. [Russ.] P.R.

A general description of the method (with diagram), recommending the following parameters: barometric pressure 0·05–0·1 kg./sq. cm., max. temperature of the material 80–100° C., frequency 350–1500 kilocycles/sec.

5192. ROMANOVSKIJ, S. G. Indukcionnaja suška drevesiny tokami promyšlennoj častoty. **[Induction drying of wood with currents of industrial frequency.]** *Derev. Prom.* 9 (9), 1960 (11–3). [Russ.] P.R.

Describes the method, and the conversion of a conventional kiln to induction drying with a current of 50 cycles/sec. In this converted kiln it takes 60–80 KWH to dry 1 cu. m. of sawn timber, 60–80 mm. thick, from 70–80 to 8–12% m.c., and on average it takes 0·2–0·4 KWH to remove 1 kg. of water from the wood.

5193. MARSHALL, P. E. **Chemical seasoning; a colour test for urea.** *Aust. Timb. J.* 26 (11), 1960 (144–5). 1 ref.

Timber that has been soaking in urea solution is washed in tap water and dried. After cross-cutting, the cut surface is brushed over with Ehrlich's reagent, which is then burned off or allowed to dry off. A bright coloration corresponding with the depth of penetration is developed.

5194. MITCHELL, H. L., and IVERSEN, E. S. **Seasoning green-wood carvings with polyethylene glycol-1000.** *For. Prod. J.* 11 (1), 1961 (6–7).

Small objects carved from green Walnut on a duplicating lathe were soaked for varying periods at varying temperatures in 30% polyethylene glycol-1000. Retentions in the outer $\frac{1}{8}$ in. varied from 11·8% (by weight) for 21 days at 65° F. and 10·1% for 4 days at 140° to 6·4% for 14 days at 65°. No degrade occurred in drying at 30% r.h. and 80° or at room temperature, against 70% and 25% rejects in untreated controls. Similar results were obtained for Cherry (treated 8 days at 130°) but Maple so treated split heavily under both schedules. The treatment did not result in high dimensional stability [cf. *F.A.* 21 No. 3785].

5195. DOST, W. A. **Research project. Index No. 3.23211. Interim report A. August 15, 1960. Weathering of solvent seasoned Redwood.** California Redwood Association, San Francisco. 1960. pp. 5. P.R.

Briefly presents and compares the results of weathering tests on 36 matched Redwood panels which were either kiln-dried (*k*) or solvent-seasoned in acetone (*s*) in the rough blanked green condition, followed by 5 commercial finish treatments. The finishes of (*s*) were not noticeably affected by 22 months' exposure, the panels only weathering to a lighter tan colour than (*k*) panels. Surface checking and, to a lesser degree, surface "fiberizing", were, however, more severe on (*s*) than on (*k*). Because of the lack of control over the m.c. of (*s*) after exposure, further tests are suggested to determine whether these faults are due to m.c. variations or to the solvent-seasoning process itself.

848. Timberyard Practice. Handling and Storage of Timber

See also No. 5071.

5196. TAROCIŃSKI, E. Badania nad obniżeniem się jakości i wartości iglastego drewna tartacznego składowanego na lądzie, przecieranego w okresie III i IV kwartału. **[Investigations on the fall in quality and value of coniferous sawlogs land-stored**

for conversion in the third and fourth quarters of the year.] *Prace Inst. Tech. Drewna* 7 (3), 1960 (51–77). 13 refs. [Pol.russ.e.] P.R.

An analysis for Polish conditions. The worst losses are caused by deterioration of logs of quality classes I and II. It is thought that all sawmills where logs are stored on dry land should introduce water sprays or chemical treatments to preserve the logs, and also seasonal sawmilling, whereby all logs of quality classes I and II (and perhaps eventually logs of all quality classes) would be converted by the end of June.

5197. Skalický, Č., and Vondráková, M. **Preservation of moisture during storage of wood for mechanical pulping**. *Papír a Celulosa* 15, 1960 (136–9). [Cz.] From *abstr.* in *Chem. Abstr.* 55 (4), 1961 (3976). P.R.

Reviews the literature, and describes experiments dealing with moisture differences during storage in timber yards. Spraying proved the most satisfactory method of moisture preservation.

849. Miscellaneous

See No. 5033.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See also section 815 and Nos. 4106–12.

5198. Peterson, O. Sågtimmerkvaliteten i Kalix Ådal. **[Sawtimber quality in the Kalix River valley.]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. *R.*27, 1960. pp. 16 + [39]. 2 refs. [Sw.]

An analysis of the scaling certificates of the Norrbotten Scaling Association for the 1953/54 logging season. Data are presented on volume, dimensions, defects, etc. for nearly a million logs, the majority of Pine. Quality, as expressed by a quality index, decreased with increasing top diameter and with increasing altitude of origin.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 4112–3, 4322, 4533, 5178.

5199. Furuya, T. **Detection of internal wood defects by radio-isotopes. I. Energy distribution of gamma-rays and beta-excited X-rays transmitted through wood media**. *J. Jap. Wood Res. Soc.* 7 (1), 1961 (24–9). 6 refs. [E.e.jap.] P.R.

A preliminary study of the possibility of determining the necessary conditions for non-destructive testing of Beech samples of constant (ca. 15%) m.c. and varying thicknesses up to 60 cm. by 'scanning' with penetrating radiation from two γ-ray sources, Co^{137} and Ir^{192}, and from a Sr^{90}, β-excited X-ray source, recording the passage of the rays with a 'scintillation spectrometer'. The experimental procedure is described, and preliminary data graphed to show the energy distribution of each photon source according to wood thickness.

5200. Pagony, H. Egészséges álgeszt—beteg álgeszt? **[False heart—sound or diseased?]** *Erdö* 9 (11), 1960 (409–13 + smries. in suppl.). 8 refs. [Hu.g.russ.]

The author asserts that all false heart (illustrated in 4 Poplar species) is pathological in origin, though, in "sound false heart", rot is not involved, but only "incipient humification" of plasma substances. In technical properties such wood is scarcely distinguishable from sound wood. "Diseased false heart" already shows rot.

5201. Lassen, L. E., and Cooper, G. A. **Significance of tension wood in furniture cuttings of Red Oak**. *Rep. U.S. For. Prod. Lab., Madison* No. 2193, 1960. pp. 6 + 3 photos, 3 tbls. 5 refs. P.R.

A high % of the Red Oak [*Quercus borealis*] from S. Illinois contains some tension wood (t.w.) but it cannot be reliably determined by visual characteristics. Examination of furniture cuttings of Red Oak indicated that warping associated with t.w. does not appear to be as serious a problem as expected, but these conditions apply only to Red Oak from S. Illinois and may not hold for other species. *From authors' summary.*

5202. Berlyn, G. P. **Factors affecting the incidence of reaction tissue in *Populus deltoides* Bartr.** *Iowa St. J. Sci.* 35 (3), 1961 (367–424). 58 refs. O.R.E.

Samples of tension wood were taken at b.h. from 84 trees (mean age 46 years) in 14 bottomland stands. Images of cross-sections (including cambium and three annual rings) were projected on paper grid systems, and counts made of stimulated and non-stimulated cells in randomly selected grid squares. Induction of the gelatinous layer was found to occur early in cellular ontogeny. The proportion of gelatinous fibres (p.g.f.) was positively correlated with radial growth and the number of cells per unit area. Vessel size was reduced in reaction tissue. Lean showed the strongest correlation with p.g.f. Tension wood increased with increasing lean and, for the age-group and situations examined, there appeared to be one over-all regression coefficient for p.g.f. as related to lean. The rate of and capacity for reaction-tissue production were depressed with the onset of senescence, the duration of stimulus, and the levelling off of diameter growth. Available P was significantly and positively related to p.g.f. Crown volume was correlated with p.g.f., but its effect varied with age and condition of the tree. Fast-grown trees had comparatively more tension wood than slow-grown trees with equivalent lean. Openings in the canopy were a cause of lean and therefore of tension wood; proper stocking and perhaps mixture with *Acer saccharinum* should be considered as ways of preventing quality loss. Phototropic responses at stand margins also reduced merchantability of Cottonwood, and this may also be minimized by border rows of some geotropic species. *From author's summary.*

5203. Nakamura, G., and Takachio, H. **Reflection of light and surface roughness on sanded surface of wood.** *J. Jap. Wood Res. Soc.* 6 (6), 1960 (237–42). 5 refs. [E.e.jap.] P.R.

Describes experiments made to clarify the relationship between the intensity of reflected light and the surface roughness of *Picea jezoensis*, *Fraxinus mandshurica*, *Quercus mongolica*, *Fagus crenata* and *Betula maximowicziana*, measured on 40 × 40 mm. test-pieces from quarter-sawn planks, belt-sanded in the fibre direction (on sanders of 4 different grit sizes), placed at 45° to a beam of light, and then rotated. Tabulated and graphed results are presented to show the relationship for each species and surface tested, and an empirical formula indicating its linear nature was derived.

5204. KININMONTH, J. A. **Checking of intergrown knots during seasoning of Radiata Pine sawn timber**. *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 30, 1961. pp. 16. 6 refs.

The checking of intergrown knots is caused by differential shrinkage within the knot and between the knot and the surrounding wood. Checking commences early in drying because the knots, with relatively low initial moisture content, dry rapidly from their exposed end-grain. Knots of high resin content show less tendency to check than those of low resin content. Knots embedded in heartwood check less than those in sapwood, and in sapwood checking is more severe in large knots. Of the drying variables (temperature, initial wet-bulb depression, and final m.c.) the final m.c. has most effect on severity of knot checking. To keep knot checking to a minimum, kiln schedules should aim at as high a final m.c. as the specifications will allow. *Author's summary.*

853. Grading of Wood in the Rough

5205. FENTON, R. **Timber-grade studies on Corsican Pine in the Tapanui District and their silvicultural implications**. *N.Z. J. For.* 8 (2), 1960 (218–30). 5 refs.

Logs from a random selection of final-crop 52-year-old *Pinus nigra* trees were sawn to 1-in. boards and 2-in. framing timber. Grade recovery from sawing to framing was fairly good, but, owing to early encasement of knots, board grades were poor. Maintenance of a deep green crown improves recovery of board grades; acute branch angles and butt sweep accentuate degrade due to knot encasement. A practical division at a sawmill is to cut logs ⩽ 8 in. in small-end diameter, to boards, and larger logs predominantly to framing timber. Further tending of these old stands is not justified. Investigation of younger stands confirmed that the timing of pruning is vital, and that wider initial spacing up to 8 × 8 ft. results in deeper green crowns and gives greater latitude for timing tending. The maximum top-height limits deduced for the timing of pruning to 6 ft. before timber degrade through knot encasement occurs are 14 ft. for 4 × 4 ft., 16 ft. for 6 × 6 ft., and 20 ft. for 8 × 8 ft. spacing. Comparable limits for pruning to 16 ft. are 32 ft. for 4 × 4 ft. and 40–44 ft. for 8 × 8 ft. spacing. *From author's summary.*

5206. YANDLE, D. O. **Method of indirect calculation for use in log grade analyses**. *Rep. U.S. For. Prod. Lab., Madison* No. 2194, 1960. pp. 25 + 4 tbls. P.R.

Shows, both algebraically and by numerical examples, a method of calculation, which should be useful in a variety of applications, in which the prices or price relatives are not introduced till the final step. In this form, the calculations allow a change from one price structure to another by repeating only the final step in the analysis. To simplify this presentation, the derivations are given only in terms of quality index, but the general method applies equally well for value per 1000 bd. ft.

5207. CALVERT, W. W. **Grading hardwood logs for factory lumber**. *F.P.L. tech. Note For. Prod. Lab. Can.* No. 18, 1960. pp. 27. 14 refs.

Presents a system of grading E. Canadian Yellow Birch and Hard Maple, based on current trade usage, and referring to earlier work at Madison in which use was made of the provisions of hardwood timber grades basing quality on the amount of clear area between defects [cf. *F.A.* 14 No. 3927].

854. Grading of Converted Timber

See also Nos. 5025, 5104, 5205.

5208. Sortering av sågat exportvirke. [**The grading of sawn export timber.**] Föreningen Svenska Sågverksmän, Stockholm. 1960. pp. 44. [Sw.] Price *DM.*23.50. From review in *Holz-Zbl.* 87 (34), 1961 (535–6). [G.]

These non-compulsory grading instructions, compiled by a representative Committee, are in 4 parts, illustrated by many coloured photographs. (1) General principles, (2) Defects of quality and condition, (3) Descriptions of grades (tabulating permitted defects for 6 classes), and (4) Terminology.

5209. Vientisahatavaran lajitteluohjeet. [**Instructions for the grading of export timber.**] Association of Finnish Sawmillmen, Helsinki. 1960. pp. 51. [Fi.E. or Sw.] Price *DM.*41. From *review* in *Holz-Zbl.* 87 (34), 1961 (535–6). [G.]

On lines similar to the Swedish publication [see preceding abstract]. Though fuller in some respects, (inclusion of poorer grades), it has no terminology section. The English translation is 21 pp. long.

5210. BURGESS, H. J. **The development of stress grading rules for Malayan timbers (Part II)**. *Malay. Forester* 23 (4), 1960 (332–42). 6 refs.

[Cf. *F.A.* 22 No. 2530.] This part of the article considers sloping grain, curvature, and sound sapwood (including wane), borer holes, decay, end splits, stain, twist, compression failures and brittle heart, boxed heart, shakes and checks, included phloem, resin and bark pockets, and undersize.

5211. **Commercial Standard CS 122–56. Western softwood plywood. A recorded voluntary standard of the trade.** Office of Technical Services, U.S. Department of Commerce, Washington, D.C. 1960. pp. 32. P.R.

In recognition of the growing economic importance in the U.S.A. of Western Larch, Western Hemlock, Noble, Silver, White, Grand and California Red Fir, Redwood, Port Orford, Western Red and Alaska Cedar, Sitka and Englemann Spruce, Ponderosa Pine, and *Populus trichocarpa*, in the manufacture of plywood, standard grading rules are presented covering nine grades each of interior- and exterior-type Western softwood plywood. This is a laminated board for panelling, sheathing, subflooring, exterior siding, concrete forms, cabinet work etc. The standard includes tests, standard sizes, size tolerances, re-inspection rules, grade-marking provisions and nomenclature and definitions, and its general adoption and use should facilitate the procurement of the right material for a given purpose, and enable architects, engineers, contractors, and other users to specify their needs precisely.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and other Cellulose Derivatives

See also Nos. 5038 *et seq*., 5197.

5212. **Technical Association of the Pulp and Paper Industry**. *Tappi Yearbook 1960–61*, 1960. pp. 571. P.R.

Includes details of the Tappi "Fibrary" (an exhaustive library of plant, including wood, fibres), and up-to-date indexes of Tappi standards, routine control methods and data sheets.

5213. PEEL, J. D. **Pulp and paper manufacture in Malaya. Part V. Central Kedah as a paper-making centre**. *Malay. Forester* 23 (4), 1960 (255–87). 21 refs.

Makes a detailed examination of the features of the region that would be of interest to the organizers of a pulp and paper industry. The availability of raw materials, water, power, and suitable sites are considered, and the results of laboratory examinations of rice straw and Rubberwood and of Bamboo are briefly related. [Cf. *F.A.* 22 No. 2538.]

5214. CHIDESTER, G. H., and SCHAFER, E. R. **Pulping of Asian and Australian wood and plant fibres**. *Rep. U.S. For. Prod. Lab., Madison* No. 2211, 1961. pp. 14 + 5 tbls. 5 refs.

Briefly discusses pulping and papermaking experiments over the past 33 years at the U.S. Forest Products Laboratory, made on the following wood species: *Eucalyptus gigantea* from Tasmania [cf. *F.A.* 20 No. 3918]; *Cananga odorata, Parkia javanica, Shorea polysperma, S. negrosensis, S. philippinensis, Pentacme contorta,* and *Pinus insularis* from the Philippines; *P. nigra, P. radiata, Populus alba* and *Beilschmiedia tawa* from New Zealand; and *Excoecaria agallocha* from Pakistan. Though varying in degree of quality, all were indicated to be technically suitable for making some kind of paper or other pulp product.

5215. LOETSCH, F. **Report to the Government of Indonesia on aspects of forestry in relation to the rayon plant project in south Sumatra**. Extended Technical Assistance Program, FAO, Rome. *FAO/Report* No. 1278, 1960. pp. 20 + 9 photos, 1 map. 6 refs.

In 3 parts: (1) Inventory of the Semangus Forest; (2) The Semangus Forest as a long-term source of raw material for the rayon project; (3) Proposals for forestry organization aimed at an attainable and sustained supply of raw material for the rayon project.

5216. BENDER, W. L. **Raw material prospects for the Colombian paper industry**. *Carib. For.* 21 (1/2), 1960 (21–3).

The 8000 tons of hardwood pulp produced in 1960 is expected to rise to 27,500 by 1965. Sajo (*Campnosperma panamensis*) and Cativo (*Prioria copaifera*) growing in pure stands are likely pulp species. *Pinus elliottii* and *P. patula* have made exceptional growth in trial plots.

5217. PETROFF, G., and DOAT, J. Caractéristiques papetières de quelques essences tropicales de reboisement. Tome 1. **[Paper-making qualities of some tropical species used in afforestation. Vol. 1.]** *Publ. Centre Tech. For. Trop.* No. 19, 1960. pp. 139. [F.]

Detailed results of tests on *Albizzia falcata, Aucoumea klaineana, Ceiba pentandra, Gmelina arborea, Melaleuca leucadendron, Spathodea campanulata,* and *Bambusa vulgaris*.

5218. KITAO, K. **[Pulping of *Acacia dealbata* Link.]** *Wood Res., Kyoto* No. 22, 1959 (30–4). 3 refs. [Jap.jap.e.*e*.]

Presents preliminary results of an examination of the pulping properties of *A. dealbata*.

5219. BIRKHIMER, E., *et al*. **The development of dirt contribution factors for dirt in pulpwood chips**. *Tappi* 43 (12), 1960 (989–93). 6 refs. P.R.

Fifteen basic dirt types were identified in an investigation made on a sample of Spruce pulpwood chips, the data obtained being used to determine the relative contribution of each type in the pulps prepared from the chips.

5220. IRWIN, D., and LAUER, B. E. **Dirt contribution values for natural dirt in coniferous woods. Balsam, Alpine Fir, and Black Spruce**. *Tappi* 44 (1), 1961 (33–5). 4 refs. P.R.

The experimental data presented on the amount of dirt introduced into pulp by natural dirt in pulpwood chips tallied with those presented earlier [cf. preceding abstract], the outer bark similarly being a far larger contributor of specks in the pulp than any other source. The inner bark and knots of every type were also found to be major dirt contributors.

5221. HARTLER, N. Nagra synpunkter på parallellskuren flis. **[Chips cut parallel to the fibre direction.]** *Svensk PappTidn.* 64 (4), 1961 (101–8). 12 refs. [Sw.sw.e.g.] P.R.

Describes U.S. and Canadian drum chippers that cut parallel to the fibre and produce chips free from compression damage, and discusses the effect of using such chips on manufacture and properties of sulphate and sulphite pulps.

5222. AMICI, V., and PASTINA, F. Pasta meccanica da legno di *Eucalyptus camaldulensis* Dehn. **[Mechanical pulp from the wood of *E. rostrata*.]** *Cellulosa e Carta* 12 (3), 1961 (17–34). Many refs. [It.it.f.e.g.]

Reviews Australian literature, and gives the results of experiments in Italy with different grindstones. The pulp obtained from Italian material was similar to that obtained from young trees in Australia.

5223. BUIJTENEN, J. P. VAN, JORANSON, P. N., and MACLAURIN, D. J. **Pulping Southern Pine increment cores by means of a small scale kraft procedure**. *Tappi* 44 (3), 1961 (166–9). 11 refs. P.R.

Describes a small-scale kraft pulping technique devised for the preparation of pulps from 10-mm. increment cores, the results obtained from 50 Loblolly Pines showing no significant differences in wood quality between selected trees and controls. However, since considerable tree-to-tree variation in wood and pulp properties is apparent, selection for wood quality is suggested in addition to selection for growth rate and form. Multiple-regression analysis showed yield to be strongly influenced by % alcohol/benzene extractives and % lignin, whereas the influence of the % of latewood is negligible. Zero-span tensile strength is correlated with fibre length and formation but appears independent of lignin content and yield. *From authors' summary*.

5224. IWANOWA [IVANOVA], I. S. Die Gewinnung von Sulfatzellstoff aus Abgängen der Holzaufbereitung. **[Getting sulphate pulp from wood conversion waste.]** *Bumažnaja Promyšlennost', Moskva* 35 (2), 1960 (13–5). [Russ.] From *abstr.* in *Holzforschung, Berlin* 15 (1), 1961 (29). [G.] P.R.

Sulphate pulp yields from coniferous stemwood were 8–12% higher than from lop-and-top. To obtain pulp with the same lignin content, 4–5% more alkali must be used with the lop-and-top. These disadvantages are attributed to the higher % of bark and young wood in the lop-and-top. It is recommended that lop-and-top should not be pulped for paper, but be used in making cardboards or fibreboards.

5225. WATSON, A. J., and DADSWELL, H. E. **Influence of fibre morphology on paper properties. Part 1.—Fibre length**. *APPITA, Melbourne* 14 (5), 1961 (168–78). 13 refs.

Investigations have been made on the influence of fibre length on paper strength, the experiments being designed to isolate the effect of fibre length from that of other morphological and chemical factors. *Araucaria klinkii* chips were delignified by treatment with sodium chlorite solution and cut into lengths ranging from 1 to 7 mm. These cut lengths were separated into "fibres" by treatment with dilute NaOH solution. Both the unbeaten and beaten pulps showed a linear relationship between "fibre" length and tearing resistance; properties associated with fibre bonding had very low values for the unbeaten pulp, but for the beaten pulp these values tended to increase with increasing fibre length. Sulphate pulps made from *Araucaria* chips cut to different lengths in the longitudinal direction showed the same general trend in strength properties. Handsheets made from *Pinus radiata* sulphate pulp were cut into 2-mm. strips and re-formed into handsheets. All strength properties were reduced by the consequent fibre shortening, tearing strength being most affected. The effect of fibre length was also studied by comparing pulps made from the innermost and outermost growth rings of *P. radiata* and *Eucalyptus regnans*. Although the fibres from the inner and outer portions of the tree differed both chemically and morphologically, it was clear that fibre length was the most important variable and that, once again, its influence was mainly on tearing strength. *Authors' summary*.

5226. TAMOLANG, F. N., and WANGAARD, F. F. **Relationships between hardwood fibre characteristics and pulp-sheet properties**. *Tappi* 44 (3), 1961 (201–16). 29 refs. P.R.

Presents the results of a study, based on pulping tests on 15 highly diversified tropical American and U.S. hardwoods, the object of which was to determine the effects of hardwood fibre characters on strength properties of kraft pulps. Pulp properties were found to be related to morphological characters of fibre, intrinsic fibre strength, and sp. gr. of the wood, and quantitative relationships were established between individual fibre characters, or combinations of characters, and specific pulp properties for a broad range of hardwood fibres. Most of these relationships accounted for 70% or more of the total variation shown by all the pulps in such properties as tensile, bursting, and tearing strengths both after and before beating. *From authors' summary*.

5227. GUHA, S. R. D., and PRASAD, B. D. **Chemical pulps for writing and printing papers from *Albizzia procera* Benth. (White Siris)**. *Indian For.* 87 (2), 1961 (124–7). 2 refs.

Laboratory trials showed that bleached sulphate pulps in satisfactory yields can be prepared from *A. procera*. The pulp was regarded as a promising raw material, but since *A. procera* is short-fibred (mean fibre length 0·90 mm., diameter 0·021 mm.), mixture with a long-fibred pulp such as Bamboo would be required for commercial manufacture.

5228. GUHA, S. R. D., SINGH, M. M., and SAXENA, V. B. **Chemical pulps for wrapping papers from a mixture of broad-leaved woods**. *Indian For.* 87 (3), 1961 (194–7). 2 refs.

Laboratory trials showed that unbleached sulphate pulps, in satisfactory yields and with satisfactory strength properties for wrapping paper, can be prepared under suitable conditions from a mixture containing 80% Sal (*Shorea robusta*) and 2% each of *Diospyros melanoxylon*, *Pterocarpus marsupium*, *Cleistanthus collinus*, *Dalbergia latifolia*, *Butea superba*, *Ougeinia dalbergioides*, *Terminalia chebula*, *T. tomentosa*, *Tectona grandis* and *Schleichera trijuga*; and also from a mixture of 40% Sal and 6% of each of the other 10 species. The results require confirmation in pilot plant trials.

5229. GUHA, S. R. D., and PANT, P. C. **Chemical pulps for writing and printing papers from *Ailanthus excelsa* Roxb**. *Indian For.* 87 (4), 1961 (262–5). 2 refs.

Laboratory experiments on the production of sulphate pulps are described. Mean fibre length of the pulp was 1·33 mm. and mean fibre diameter

0·035 mm. Easy bleaching pulps in good yields with satisfactory strength properties could be prepared under suitable conditions.

5230. Samuels, R. M. **Magnefite pulping of Douglas-Fir**. *For. Prod. J.* 11 (3), 1961 (119–21). 12 refs.

Describes small-scale experimental cooks which suggest that the process [cf. *F.A.* 19 No. 4982] may have promise for the pulping of Douglas Fir waste wood. The pulps were superior in strength and yield to acid sulphite pulp, and to kraft pulp in yield. Pollution and recovery aspects appeared favourable. Pretreatment with hot water improved the pulping of heartwood, which otherwise was more difficult to pulp than sapwood.

5231. Mai Aung, U **Bleachable pulp from Burmese Bamboo by the chlorination process**. *Pulp Paper Mag. Can.* 62 (3), 1961 (230–2).

Reports experiments showing that bleachable pulp could be made by the chlorination process from shredded *Cephalostachyum pergracile*.

5232. Koshijima, T. **Studies on mannan in wood pulp. III. Acetyl-mannose linkages in the hemicellulose extracted with dimethylsulfoxide**. *J. Jap. Wood Res. Soc.* 6 (5), 1960 (194–8). 11 refs. [E.e. jap.] P.R.

Hemicellulose extracted from the holocellulose pulp of *Pinus densiflora* contained a considerable amount of mannose and acetyl, and the oxyhemicellulose then prepared by periodate oxidation retained unchanged glucose, mannose and a small amount of xylose. Owing to de-acetylation, α-glycol contents of the oxyhemicellulose increased, and part of the retained mannose residues disappeared, the latter corresponding to the increased amounts of α-glycol. The other sugars present in the oxyhemicellulose remained quantitatively unaltered by de-acetylation, which was held to indicate the presence of acetyl-mannose linkages at C2 or C3 of the mannose residues. *From author's summary.*

5233. Miyazaki, K. **[Behaviour of Ca-oxalate contained in Beech wood [*Fagus crenata*] during pulp manufacture.]** *J. Jap. Wood Res. Soc.* 6 (1), 1960 (19–25). 3 refs. [Jap.jap.e.*e*.] P.R.

5234. Njukša, Ju. P. Sistematičeskij obzor gribov, obitajuščih na bumage, knigah i v bumažnoj masse. **[A taxonomic survey of fungi living on paper, books and pulp.]** *Bot. Ž.* 46 (1), 1961 (70–9). 39 refs. [Russ.e.]

A list is compiled (on the basis of the author's own data and world literature) showing 266 species and 11 varieties of fungi (105 genera) that damage books, documents, etc. in libraries, archives and museums. The list comprises 13 species of Phycomycetes, 43 species of Ascomycetes, and 210 species of Fungi Imperfecti. Frequency of occurrence, and material attacked are noted for each species.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 4972–3, 5101.

5235. Carroll, M. **Simplified data-handling techniques for particle board and hardboard**. *For. Prod. J.* 11 (3), 1961 (149–55).

Describes the application of certain simplifying techniques to the analysis of physical test data, exemplified by flexural strength of particle board and fibreboard, and internal bond strength for particle board, including algebraic transformations of the formulae relating these test properties to density, standardization of test variables, the use of non-linear representations and non-linear scales, etc. *From author's summary.*

5236. **Board materials**. *Wood* 26 (4), 1961 (133–63).

An annual supplement [cf. *F.A.* 21 No. 5117] containing the following articles: Techniques for timber grounds [for fibre building boards] (*G. Davies*); Shopfitting; The FIDOR test hut; Types of ceilings and roof linings; Categories of fibre building boards [a 10-page classified list of sizes and properties of brands within the FIDOR membership]; Basic data on fibre building boards; Lipping and jointing of particle board (*J. Pound*); Working properties of particle board (*L. E. Akers*); Construction in particle board: a Norwegian tourist centre.

5237. Greene, S. **What we learned in our study of 11 particle boards**. *Wood, Chicago* 66 (4), 1961 (30–2, 78–9). P.R.

Describes tests aimed at assessing the end-use suitability of 11 boards representative of all major types, viz. homogeneous (*a*) flake (Aspen, Douglas Fir, Southern Pine, Willow, mixed hardwoods) and (*b*) particle or shaving (Southern Pine); (*c*) 3-layer flake (Southern Pine); (*d*) 3-ply—flake faces, particle cores (Douglas Fir); (*e*) 3-layer, particle (Douglas Fir). Tabulated data on static bending (bending strength and stiffness), density, internal bond strength, screw withdrawal resistance, dimensional stability, gluability (shear), and machining properties are presented, from which the following general conclusions relating to the specific end-uses of the boards were drawn: (1). Static bending values for (*a*) were ca. 1½–2 times those for (*b*), (*e*) being intermediate, with stiffness values equal to those for (*a*). Veneering significantly increased the bending strength and stiffness of all boards, and tended to reduce the differences between them. (2). Significantly higher face and edge screw-withdrawal-resistance values were found for (*a*) than for the other boards. (3). All boards glued very easily with a room-temperature-setting urea resin, no apparent pattern emerging for shear strength || to the board faces. (4). For (*a*) higher internal bond strength values were obtained than for the other boards. (5). The best dimensional stability in thickness (when exposed to a 30% r.h.) was observed in (*d*) and (*e*), and the greatest linear dimensional changes in (*b*). (6). For (*b*) the machining properties were poorer than for the other boards, and for (*a*) there was a tendency in face-drilling for the drill to "lead off", especially when using smaller drills.

5238. BOSSHARD, H. H. Fluoreszenzmikroskopische Untersuchungen in Spanplatten. **[Investigations of particle boards by fluorescent microscopy.]** *Beih. Z. Schweiz. Forstver.* No. 30, 1960 (13–20 + 6 photos). 12 refs. [G.g.]

Describes a method of rendering adhesives fluorescent, and discusses, with illustrations, the distribution of adhesives in the three layers of Novopan particle boards made from Silver Fir with different amounts of resin. No migration of adhesive from one layer to another was found.

5239. SCHMIDT-HELLERAU, C. Gegenüberstellung der Amino- und der Phenoplaste. **[Comparison of amino- and phenolic adhesives.]** *Holz-Zbl.* 87 (32), 1961 (521–3). [G.g.]

Describes accelerated weathering tests with Spruce particle boards made in the laboratory with urea, urea + melamine, or phenol formaldehyde resins. In all cold-water treatments, including prolonged dry/wet cycles, the urea boards were superior in swelling and in strength properties ⊥ to the surface, not only at equal resin costs (i.e. higher urea resin content) but also at equal resin contents.

5240. VINOGRADOV, JU. N. O pressovanii stružečnyh plit s bardjanym koncentratom. **[Pressing particle boards made with a sulphite-alcohol liquid residue.]** *Derev. Prom.* 9 (8), 1960 (13–4). 1 ref. [Russ.] P.R.

Presents graphical data on the properties of boards made with the addition of H_2SO_4 in various amounts and concentrations to the sulphite-alcohol liquid residue [see *F.A.* 21 No. 5125]. It was found that water absorption and thickness swelling of the boards fell with increasing amounts of H_2SO_4, but so, too, did the bending strength. Water absorption and thickness swelling were little influenced by the concentration of H_2SO_4 but best values were obtained with concentrations of 40–60%. Water absorption, thickness swelling and bending strength fell with increasing press temperature (from 150 to 190° C.). The qualities of boards made with sulphite-alcohol residue + H_2SO_4 were almost the same as those made with urea resins, and they could be easily veneered.

5241. MININ, A. N., and LAHTANOV, A. G. Vlijanie vlažnosti syr′ja na fiziko-mehaničeskie svojstva p′ezotermoplastikov. **[Effect of the moisture content of the raw material on the physical and mechanical properties of hot-pressed sheets.]** *Derev. Prom.* 9 (9), 1960 (14–5). [Russ.] P.R.

Sheets were made (190° C.; 250 kg./sq. cm.; 2·5 min. per mm. of thickness; no binder) from (*a*) Birch sawdust, and (*b*) hydrolysis lignin. Both materials were pressed at 0, 5, 10, 15, 20, 30 and 40% m.c., (*a*) also at 60%, and (*b*) also at 177% m.c. Static bending, water absorption and swelling tests were made and the results are graphed. The optimum m.c. at which to press was found to be 10–15% for (*a*), and 10–20% for (*b*).

5242. BURROWS, C. H. **Some factors affecting resin efficiency in flake board.** *For. Prod. J.* 11 (1), 1961 (27–33). 17 refs.

The effects of moisture content at time of flaking (26 or 116%), growth rate (of Douglas Fir), resin content (2 or 6%) and resin droplet size were tested. Results suggest a superiority in surface smoothness of flakes from fast-grown wood and of strength in boards made from flakes cut at 26% m.c. and with fine atomization, the improvement being particularly evident for boards made with the lower resin content.

5243. POST, P. W. **Relationship of flake size and resin content to mechanical and dimensional properties of flakeboard.** *For. Prod. J.* 11 (1), 1961 (34–7). 4 refs.

The ratio flake length/thickness was better correlated with board properties than either dimension separately. Increases in resin content increased bending strength only moderately. [Cf. *F.A.* 20 No 3922.] *From author's summary.*

5244. HABAROV, V. I., NEHAJ, S. M., and NOVAK, V. M. Otečestvennye pressy dlja proizvodstva stružečnyh plit. **[Soviet presses for particle board production.]** *Derev. Prom.* 9 (8), 1960 (8–10). [Russ.] P.R.

Describes the three models of presses that are to be manufactured in the U.S.S.R., viz. the P760A, P763A, and the Ižorskij Mill press (630, 1250, and 2000 tons respectively). Specifications of the three are: number of daylights 10, 10, 9; press temperature 180° C.; max. specific pressure 23, 23, 30 kg./sq. cm.; board sizes 120 × 195, 140 × 350, and 175 × 350 cm.; calculated output 9, 25 and 30 thousand cu. m. particle board p.a. Details of design are illustrated and discussed.

5245. CLARK, J. W. **Decay resistance of experimental and commercial particle board.** *Rep. U.S. For. Prod. Lab., Madison* No. 2196, 1960. pp. 5 + 1 photo, 2 tbls. 3 refs. P.R.

To ascertain the decay resistance (d.r.) of non-preservative-treated particle board, 8 experimental and 9 commercial Douglas-Fir board samples (½ in. and ¼–¾ in. thick respectively) were exposed for 12 weeks to attack by *Poria monticola* and *Lenzites trabea* under conventional soil-block testing conditions. Four blocks of each particle board were exposed individually in separate bottles to each fungus, the amount of decay being measured by the resulting loss in weight. Generally, results with *P. monticola* are considered to reflect more closely the comparative d.r. to be expected of materials in severe exposures, such as direct soil contact or distinctly damp conditions; those obtained with *L. trabea* are probably more useful in estimating the relative d.r. of materials exposed to moderate or low-hazard conditions. The following d.r. classes (according to mean wt. loss in %) were used: (I) very resistant, 0–10; (II) resistant, 11–24; (III) moderately resistant, 25–44; and (IV) non-resistant, ⩾45. Most of the samples tested fell into classes II and III with respect to decay by both fungi. However, although visual inspection showed a very wide range of delamination, ranging from total delamination and disintegration of the test blocks during drying after exposure, to a merely swollen state in which the blocks could not be readily parted, it was not determined to what degree these variations resulted from delamination alone or to what extent the decay fungi modified the degree of delamination. Severe delamination was not necessarily associated with high wt. loss, nor was lack of it closely correlated with low wt. loss; it is probable that factors other than those most contributing to d.r. were responsible for the absence or presence of delamination. Further work is necessary for generally improving particle-board d.r., and great emphasis is laid on (1) the need for further clarification of the variables in composition and fabrication (hinted here as significantly influencing d.r.), and (2) the improvement of d.r. that can be effected by including preservatives.

5246. Kumar, V. B. Neuere Untersuchungen an ölgehärteten Faserplatten. **[Recent investigations on oil-hardened fibreboards.]** *Holz Roh- u. Werkstoff* 19 (1), 1961 (15–20). 5 refs. [G.g.e.] P.R.

Discusses the technique of oil-hardening (i.e. impregnation of the boards with a drying oil after pressing), and the influence of board quality, oil uptake, and final drying on the finished product. The quality of the pressed boards has a decisive influence on the properties of the finished (oil-hardened) board, and oil absorption is closely related to bending strength. The addition of catalysts increases board strength considerably. The gluing properties of oil-hardened boards are also briefly discussed.

863. Wood Hydrolysis. Saccharification

5247. **Working Party on wood hydrolysis (second meeting, Tokyo, 10–15 October 1960).** [*Docum.*] *FAO Tech. Panel Wood Chem.* Nos. *FAO/WC/*60/*WH*1 to *WH*9; *WH*11 to *WH*12, 1960. pp. 16; 9; 5; 3; 49; 4; 13; 29; 21; 11; & 9. Many refs. [E.] Limited distribution.

Contains the following papers: Wood saccharification by HCl gas process (*J. Kusama* et al.); Liquefaction of lignin (*K. Kashima*) [high-pressure hydrogenation in a pilot plant yielded 85% or more from spent liquor and wood-hydrolysis lignin]; The behaviour of lignin during wood hydrolysis (*K. Kratzl*); The forest resources of Japan, the timber supply programme and the price of logs used in the wood chemical industry (The Japan Forestry Agency); The development of a concentrated H_2SO_4 wood hydrolysis process in Japan (*K. Takubo* et al.). High-pressure hydrogenation of the lignin residues from the concentrated H_2SO_4 wood hydrolysis process (*K. Takubo* et al.); Wood hydrolysis lignin and its utilization (*K. Kratzl*) [a review with 24 refs.]. Possible products from a wood chemical industry (*M. Oshima* et al.) [a review, with 34 refs., >50% Japanese]; Synthesis of amino acids from furfural (*G. Noyori*) [chiefly glutamic acid and lysine]; Studies on the utilization of lignin: I. High pressure hydrogenation of wood hydrolysis lignin residue (*H. Ohtsuka* et al.); II. Wood adhesives from lignin (*S. Mori* et al.); and some economic aspects of wood hydrolysis (*J. Savant*) [expressing doubts of its profitability under Western European conditions].

5248. Odintsov [Odincov], P. N., *et al.* **Hydrolysis of cellulose-containing materials with small quantities of sulfuric acid.** Israel Program for Scientific Translations, Jerusalem. [*n.d.*] pp. 10. 12 refs. Transl. for the National Science Foundation, and the U.S. Department of Agriculture, Washington, D.C., from *Gidrol. lesohim. Prom.* 10 (8), 1957 (3–6). [See *F.A.* 21 No. 1189.] Price $0.50. Available from Office of Technical Services, Department of Commerce, Washington, D.C.

864. Utilization of Lignin

See Nos. 5241, 5247.

866. Utilization of Wood Extractives

See also No. 4965.

5249. Kontek, W. Z badań nad zawartością żywicy w pozrębowej karpinie sosnowej. **[The crude resin content in Scots Pine stumpwood.]** *Prace Inst. Tech. Drewna* 7 (3), 1960 (3–28). 15 refs. [Pol.russ.e.] P.R.

Analysis of stumps from stands of age classes V, VI, and VII in dry, fresh, and mixed *Pineta* revealed that the crude resin content (*a*) of the sapwood averaged ca. 7%, and increased only very slightly with tree age; site had little effect, though resin contents were highest on dry sites, (*b*) of the heartwood averaged 21%, and increased with tree age; site had little effect, though resin contents were highest on fresh sites. The % of turpentine (volatile fractions) in the crude resin was ca. 21 in the sapwood and 14 in the heartwood. Crude resin content increased from the top of the tap-root to the root collar (where it reached its maximum), and then decreased slightly in the part of the stump above ground; it was only slightly less in the lateral roots than in the top of the tap-root.

5250. Golikov, L. V., and Kozlov, V. N. O processe ėkstrakcii smolistyh veščestv iz ščepy pnevogo osmola. **[The process of extracting resinous substances from chipped Scots Pine stumpwood.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (141–6). 10 refs. [Russ.russ.]

Describes the apparatus used in, and tabulates and graphs the results of, experiments to determine the effect of the degree and method of stumpwood chipping on the yield of resinous substances by benzene extraction at a constant 80° C. The rosin yield from chips produced by comminution across the grain was greater than that from chips produced by comminution along the grain, and was greater from small than from large chips.

867. Destructive Distillation

5251. [Pritchard, W. M.] **Simplified batch retort permits economic charcoal production.** *Woodwkg. Dig.* March, 1961 (48–50). P.R.

Describes the retort (a vertical mounted steel cylindrical tank, 10 ft. in diam., 16 ft. high) and its operation, and presents details of economics and cost analysis. Its simplicity and suitability as a profitable outlet for woodwaste are stressed.

5252. Liverovskij, A. A., Cacka, Ė. M., and Šmulevskaja, Ė. I. Opyt polučenija lesohimičeskih produktov pri sžiganii berezovoj drevesiny v skorostnoj topke CKTI sistemy V. V. Pomeranceva. **[Trial in obtaining chemical products during the combustion of Birch wood in the CKTI rapid burner (V. V. Pomerancev system).]** *Lesn. Ž., Arhangel'sk* 3 (4), 1960 (141–8). 5 refs. [Russ.]

An account of the work of the unit [see *F.A.* 18 No. 3506] with chipped Birch wood. The modified gas purification process is described and illustrated.

5253. Cacka, Ė. M., and Genender, L. S. Opyty po suhoj peregonke bolotnogo pnja. **[Dry distillation trials with Scots Pine stumps from peat bogs.]** *Lesn. Ž., Arhangel'sk* 3 (3), 1960 (152–5). [Russ.russ.]

Analysis showed that such stumps were quite suitable for fuel and gave satisfactory yields of charcoal and volatile acids, and good yields of resin.

5254. Moore, W. E., and Beglinger, E. **A method of charcoal analysis.** *For. Prod. J.* 11 (1), 1961 (17–9).

Describes an accurate method of determining moisture, volatile matter, ash, and fixed carbon. *From authors' summary.*

5255. Korjakin, V. I., and Vodolazov, P. N. Promyšlennye opyty polučenija furfurola metodom piroliza. **[Industrial trials at obtaining furfural by pyrolysis.]** *Gidrol. lesohim. Prom.* 14 (1), 1961 (9–12). 1 ref. [Russ.] P.R.

An account of the full-scale industrial trials [cf. *F.A.* 22 No. 2581] on pyrolysis of Birch wood.

89. Other ('Minor') Forest Products

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 4965, 5002.

5256. **Tannin content of Philippine barks.** *Tech. Note For. Prod. Res. Inst. Philippines* No. 7, 1960. pp. 3 + 1 tbl. 4 refs. P.R.

Discusses various test methods that will be necessary for assessing the tannin content of ca. 3500 timber species. Tabulated data are given for the tannin content of some 25 species.

5257. Pidal, R. N. Determinación de materias tanantes en agallas indígenas. **[Tanning materials in galls of native species.]** *Foll. téc. Adm. Nac. Bosques, B. Aires* No. 7, 1960. pp. 15 + 2 plates. 6 refs. [Span.span.]

Lists 17 types of gall found on 12 native species, with the associated insect (where known), and presents the results of physical and chemical analyses of the galls with particular reference to tannin content. The highest value for tannin content was found in galls of *Strychnos brasiliensis*, but neither this nor that of any of the other galls investigated was high enough to be of any commercial value.

5258. Roux, D. G., and Paulus, E. **Condensed tannins. 7. Isolation of (−)-7 : 3′ : 4′-trihydroxyflavan-3-ol [(−)-fisetinidol], a naturally occurring catechin from Black-Wattle heartwood.** *Biochem. J.* 78 (1), 1961 (120–3). 22 refs. O.R.S. [Cf. *F.A.* 22 No. 1203.]

5259. Rao, J. B., and Sastry, K. N. S. **Isolation of glucoside from myrobalans.** *Bulletin, Central Leather Research Institute, Madras* 6, 1960 (593). From *abstr.* in *J. Soc. Leath. Tr. Chem.* 45 (2), 1961 (73). O.R.S.

The isolation of a glucoside of molecular formula $C_{13}H_{22}O_{11}$ from the aqueous extract of *Terminalia chebula* is reported.

5260. Prista, L. Nogueira, and Alves, A. Correia. Estudo fitoquímico de cascas de *Cecropia peltata* L. **[Chemical study of the bark of *C. peltata*.]** *Garcia de Orta, Lisboa* 8 (3), 1960 (615–28). 9 refs. [Port.f.e.] E.M.B.

Presents the results of a chemical analysis of the bark of *Cecropia peltata* from S. Tomé. Athough the bark is used there as a tanning material, it was found that the tannin content did not exceed 1·9%.

5261. Tominaga, T., and Yoshimura, K. **[On the constituents of the bark of *Engelhardtia formosana* Hay.]** *J. Pharm. Soc. Japan* 79 (4), 1959 (555–7). 5 refs. [Jap.*e.*] O.R.S.

5262. Tominaga, T., and Yoshimura, K. **[Studies on the constituents of the bark of *Engelhardtia formosana* Hay. VII–IX. Isomerization and isomers of engelitin (2)–(4). X. Constituents of the hot alcoholic extract.]** *J. Pharm. Soc. Japan* 80 (10), 1960 (1332–47). [Jap.e.*e.*] O.R.S.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also Nos. 4154, 5002, 5289.

5263. Puri, G. S., and Arora, R. K. **Some medicinal ferns from Western India.** *Indian For.* 87 (3), 1961 (179–83 + 6 pp. of photos). 2 refs.

Descriptive notes, distribution and medicinal uses for 14 important and common species, most of them from moist deciduous/evergreen rain-forest areas and including *Pteridium aquilinum*.

5264. Chopra, C. L., Bhatia, M. C., and Chopra, I. C. ***In vitro* antibacterial activity of oil from Indian medicinal plants I.** *J. Amer. Pharm. Ass.* (*sci. Ed.*) 49 (12), 1960 (780–1). 9 refs. O.R.S.

All the 10 oils tested showed some antibacterial activity against one or more of 10 organisms. Essential oil of leaves of *Pinus excelsa* was the most effective, followed in order by those from *P. longifolia* and *Cedrus deodara*.

5265. Brooker, S. G., and Cooper, R. C. **New Zealand medicinal plants.** *Econ. Bot.* 15 (1), 1961 (1–10). 20 refs.

Lists ca. 128 medicinal plants used by the Maori, with the part used, preparation, and applications, and reviews briefly those plants or groups (ca. 27) and the principles found in them, that appear to be of potential value in chemotherapy.

5266. Tyler, V. E. **Note on the occurrence of taxine in *Taxus brevifolia*.** *J. Amer. Pharm.*

Ass. (*sci. Ed.*) 49 (10), 1960 (683–4). 8 refs. O.R.S.

A small amount of an alkaloid from fresh needles was shown to be amorphous taxine, which probably occurs in all *Taxus* spp. No cyanogenetic glycoside could be detected.

5267. Nakaoki, T., and Morita, N. **Studies on the medicinal resources. XVI. Flavonoids of the leaves of *Castanea pubinervis* Schneid., *Hydrocotyle wilfordi* Maxim., *Sanguisorba hakusanensis* Makino, *Euptelaea polyandra* Sieb. et Zucc., *Carthamus tinctoria* L., *Lactuca repens* Maxim., *Daucus carota* L. var. *sativa* DC, *Ilex integra* Thunb., *Smilax china* L., and *S. media* Schl. et Cham.]** *J. Pharm. Soc. Japan* 80 (10), 1960 (1473–5). 9 refs. [Jap.e.] O.R.S.

5268. Tsao, D. P. N., *et al.* **A note on the biological activity of root extracts from *Pleiocarpa mutica* Benth. (Apocynaceae).** *Econ. Bot.* 15 (1), 1961 (99–103). 3 refs.

An ethyl-acetate extract was found to have hypertensive activity in rats, and the indications are that this activity is sympatholytic. Nematocidal effects indicate rather broadly intensive protoplasmic poisoning, killing both adults and larvae (*Panagrellus redivivus*). The plant is an understorey tree of evergreen and deciduous forests in tropical Africa.

5269. Goutarel, R. Alcaloïdes stéroïdes des Apocynacées. **[Steroidal alkaloids of the Apocynaceae.]** *Bull. Soc. Chim. France* 1960 (5), (769–74). 20 refs. [F.] O.R.S.

Reviews literature on the various alkaloids isolated, and discusses the possibilities of the commercial use of those from *Funtumia latifolia* and *Holarrhena floribunda*.

5270. LeMen, J. Paravallarine: alcaloïde stéroïdique du *Paravallaris microphylla* Pitard (Apocynacées). **[Paravallarine, a steroidal alkaloid of *P. microphylla*.]** *Bull. Soc. Chim. France* 1960 (5), (860–4). 17 refs. [F.f.] O.R.S.

The substance, isolated from leaves, stem and roots, is characterized.

5271. Lévy, J., Le Men, J., and Janot, M. M. Sur l'akuammicine, alcaloïde du *Picralima nitida* Stapf (Apocynacées) (1er mémoire). **[Akuammicine, an alkaloid from [the seeds of] *P. nitida*.]** *Bull. Soc. Chim. France* 1960 (5), (979–81). 5 refs. [F.] O.R.S.

5272. Nakaoki, T., and Morita, N. **[Studies on the medicinal resources. XV. Flavonoids of *Diospyros* (Ebenaceae) in Japan.]** *J. Pharm. Soc. Japan* 80 (9), 1960 (1298–9). 2 refs. [Jap.e.] O.R.S.

Leaves of *D. kaki* yielded astragalin (kaempferol 3-glucoside) and those of *D. lotus* var. *glabra* yielded myricitrin. *From authors' summary.*

5273. Nakasato, T., and Nomura, S. **[Studies on the alkaloids of Lauraceous plants. III. Alkaloids isolated from leaves of *Neolitsea sericea*.]** *J. Pharm. Soc. Japan* 79 (10), 1959 (1267–72). 13 refs. [Jap.e.*e.*] O.R.S.

Boldine, roemerine (both structurally known), laurolitsine, litsecerine, and two bases present in trace amounts were isolated. Molecular formulae are suggested for the last four.

5274. Gaind, K. N., and Bajeva, S. K. **Investigation of *Machilus macrantha* Nees. I. Pharmacognostical and phytochemical study of the root. II. Pharmacological action and chemical constitution of machiline.** *J. Amer. Pharm. Ass.* (*sci. Ed.*) 49 (10), 1960 (659–65). 17 refs. O.R.S.

5275. Costa, A. Fernandes, Vale, A. Cardoso do, and Vale, M. A. Maia e. *Albizia tanganyicensis* Bak. f.—Contribuições para o seu estudo farmacognósico. **[*A. tanganyicensis*—contributions to a pharmacognostic study.]** *Garcia de Orta, Lisboa* 8 (3), 1960 (597–614 + 3 photos). 31 refs. [Port.f.e.] E.M.B.

Presents data resulting from anatomical and chemical investigations of the bark, and the results of tests of the toxicity of aqueous solutions. Decoctions of the phloem showed greater toxicity than those of the outer bark.

5276. Ito, K., and Aoki, T. **[Studies on the alkaloids of Magnoliaceous plants. XXII. Alkaloids of *Michelia fuscata* Blume (1).]** *J. Pharm. Soc. Japan* 79 (3), 1959 (325–9). 9 refs. [Jap.e.*e.*] O.R.S.

5277. Ito, K., and Uchida, I. **[Studies on the alkaloids of Magnoliaceous plants. XXII. Alkaloids of [leaves and bark of] *Michelia fuscata* Blume. (2).]** *J. Pharm. Soc. Japan* 79 (8), 1959 (1108–11). 8 refs. [Jap.e.*e.*] O.R.S.

5278. Tomita, M., Watanabe, Y., and Furukawa, H. **[Studies on the alkaloids of Magnoliaceous plants. XXV. Alkaloids of *Magnolia grandiflora* var. *lanceolata*.]** *J. Pharm. Soc. Japan* 81 (1), 1961 (144–6). 3 refs. [Jap.e.] O.R.S.

M. grandiflora var. *lanceolata* from N. America contained, as its main base, magnoflorine but not salicifoline, both of which are present in the native *M. grandiflora*. A new base, whose chloride melted at 203·5–207°, was found. *From authors' summary.*

5279. Tomita, M., and Kunitomo, J. **[Studies on the alkaloids of rutaceous plants. VII. Alkaloids of *Phellodendron amurense*. (2) (i), (ii).]** *J. Pharm. Soc. Japan* 80 (7), 1960 (880–7). 22 refs. [Jap.e.*e.*] O.R.S.

5280. Tomita, M., and Kunitomo, J. **[Studies on the alkaloids of rutaceous plants. IX, X, XI. Alkaloids of *Phellodendron amurense*. (4) Synthesis of *dl*-phellodendrine and its isomers. (5) Synthesis of *dl*-phellodendrine isomers. (6) Isolation of candicine.]** *J. Pharm. Soc. Japan* 80 (9), 1960 (1238–48, 1300–1). 20 refs. [Jap.e.*e.*] O.R.S.

5281. Tomita, M., and Ishii, H. **[Studies on the alkaloids of rutaceous plants. VI. Alkaloids of *Xanthoxylum planispinum* Sieb. et Zucc. (1).]** *J. Pharm. Soc. Japan* 79 (9), 1959 (1228–30). 3 refs. [Jap.e.] O.R.S.

5282. ISHII, H., and HARADA, K. **[Studies on the alkaloids of rutaceous plants. XII. Alkaloids of *Xanthoxylum planispinum* Sieb. et Zucc. (2). The isolation of bases.]** *J. Pharm. Soc. Japan* 81 (2), 1961 (238–42). 10 refs. [Jap.e.*e*.] O.R.S.

5283. ISHII, H. **[Studies on the alkaloids of rutaceous plants. XIII. Alkaloids of *Xanthoxylum planispinum* Sieb. et Zucc. (3). Structure of xanthoplanine.]** *J. Pharm. Soc. Japan* 81 (2), 1961 (243–8). 23 refs. [Jap.e.*e*.] O.R.S.

5284. POLONSKY, J. Étude des constituants des graines de *Simaba cédron*; sur la structure de deux composés cristallisés: cédronine et cédronyline. **[The constituents of seeds of *S. cedron*: the structure of two crystalline compounds, cedronine and cedronyline.]** *Bull. Soc. Chim. France* 1960 (10), (1845–7). 6 refs. [F.] O.R.S.

5285. PACHTER, I. J., and HOPKINSON, A. F. **Notes on the alkaloids of *Methysticodendron amesianum*.** *J. Amer. Pharm. Ass. (sci. Ed.)* 49 (9), 1960 (621–2). 2 refs. O.R.S. [Cf. *F.A.* 17 No. 1295.]

5286. NAKAOKI, T., MORITA, N., and KISHITANI, S. **[Studies on the medicinal resources. XVII. Component of the leaves of *Tilia japonica*.]** *J. Pharm. Soc. Japan* 80 (12), 1960 (1743–5). 4 refs. [Jap.e.] O.R.S.

5287. NARASIMHAN, M. J., and THIRUMALACHAR, M. J. ***Ravenelia esculenta*, an edible rust fungus.** *Phytopath. Z.* 41 (1), 1961 (97–102). 1 ref. [E.g.] O.R.S.

Describes the fungus and the malformations it causes to shoots and inflorescences of *Acacia eburnea*, in Bombay. The infected parts, which are eaten by the local people, contain 10–15% reducing sugars and up to 8% amino nitrogen. The possibility of artificial infection in new areas was studied.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 4040, 5264.

5288. KONDO, T., IMAMURA, H., and SUDA, M. **[Studies on exuded resin of *Cryptomeria japonica* D. Don. I. On the phenolic and neutral components. (1).]** *J. Pharm. Soc. Japan* 79 (10), 1959 (1298–1300). 10 refs. [Jap.e.*e*.] O.R.S.

Sugiol, xanthoperol, ferruginol and dehydroferruginol were isolated and identified.

5289. MARUZZELLA, J. C., and SICURELLA, N. A. **Antibacterial activity of essential oil vapours.** *J. Amer. Pharm. Ass. (sci. Ed.)* 49 (11), 1960 (692–4). 10 refs. O.R.S.

Vapours of 133 essential oils, including some from leaves, wood, cones, etc. of trees, were tested on 6 organisms. Results are tabulated.

5290. KAWANO, N., and OISHI, T. **[On the essential oil of *Lindera citriodora*.]** *J. Pharm. Soc. Japan* 80 (12), 1960 (1796–8). 4 refs. [Jap.e.*e*.] O.R.S.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See Nos. 4120, 4554–5.

892.8. Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See Nos. 4561–2, 5158, 5231.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

5291. JACKSON, J. K. **Report to the Government of the Sudan on forest management.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1291, 1960. pp. 72 + 2 tbls., 1 map.

Covers: (1) general economic position of the Sudan; (2) forest resources; (3) present demand for forest products; (4) future demand for forest products; (5) methods of increasing the forest resources; (6) forest management in the Sudan; (7) management problems of various regions; (8) organization of a forest management division.

902. History of Forests and Forestry

See also Nos. 4296, 4327.

5292. JONES, E. W. **British forestry in 1790–1813.** *Quart. J. For.* 55 (1; 2), 1961 (35–40; 131–8). 5 refs.

Chiefly a digest of relevant information in the "General Views" of the Agriculture of the counties of England, Wales and Scotland, published by the Board of Agriculture between 1790 and 1813.

5293. ANDERSON, M. L. **The forest of Ettrick.** *Sylva, Edinb.* No. 41, 1961 (4–9).

The history of the forest, based on Scottish State Papers.

903. Forest Policy, General

5294. MONROY, J. A. VON. **Report to the Government of India on integration of forests and forest industries. Skeleton of a forestry and forest industries development program under India's five-year plans.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1298, 1960. pp. 117 + 17 photos, 2 dgms.

Analyses the requirements and supply of forest products for building, mining, transport and communications, woodworking industries, packaging, paper, rayon, matches, fuel, tanning, lac, rosin, turpentine, medicinal plants and essential oils.

5295. ENTRICAN, A. R. **Influence of delivered prices of forest produce on silvicultural practice in a**

developing forest economy. *Unasylva* 14 (4), 1960 (185–92).

Stresses the technical and administrative problems created in New Zealand by large-scale exotic forest establishment compressed into a very few years, and the subsequent neglect of silviculture. The trends of timber prices in the U.S.A., Sweden and Australia are compared with the artificially controlled prices in New Zealand. [Cf. *F.A.* 19 No. 1216.]

5296. **Committee recommends timber revival on the West Coast.** *N.Z. Timb. J.* 7 (1), 1960 (55); 7 (5), 1961 (47–8). 2 refs.

Proposals include a co-operative enterprise of loggers and forest department, substituting for the present colonial exploitation (chiefly by east-coast interests) of 5000 acres cut over annually, a system of selective logging aiming at the conservation of the indigenous species in *Podocarpus* and *Nothofagus* forests, with integrated local utilization including certain minima of kiln-dried and preserved timber, machined products, veneer, plywood, fibre and particle boards and hardwood pulp. Increased planting of exotics and a research organization under the D.S.I.R. are also advocated.

904. General Regional Accounts of Forests and Forestry

See also No. 4290.

5297. **Forestry and forest industry in the U.S.S.R. Report of a technical study group.** U.S. Forest Service, Washington, D.C. 1961. pp. iii + 92. 36 refs.

The report of a seven-man team that visited Russia in 1959, dealing with resources, organization of forestry and industry, management, logging, protection, utilization, research, education, etc.

5298. ELIZAROV, A. F. V lesah Mongolii. **[The forests of Mongolia.]** *Lesn. Hoz.* 13 (11), 1960 (85–9). [Russ.]

[Cf. *F.A.* 20 No. 2641.] Tabulated data on the area and standing volume of the main species are given, and also a general account of forest administration in Mongolia, the incidence of forest fires and fungi, protection forests, timber demand (617,000 cu. m. in 1960, and estimated at ca. 1 million cu. m. p.a. by 1965), logging (mainly selection felling by hand, with skidding by cart and transport by lorry), timber floating, and silviculture (thinning, measures to assist natural regeneration, nursery establishment, and afforestation form part of the current 3-year-plan).

905. Forest Statistics and Resources

See also Nos. 4961–5, 5291.

5299. WECK, J.; WIEBECKE, C. Weltforstwirtschaft und Deutschlands Forst- und Holzwirtschaft. **[World forestry and Germany's forestry and wood industry.]** BLV Verlagsgesellschaft, Munich. 1961. pp. 8 + 200. 236 refs. [G.] Price £2. 6*s*. 6*d*.

The first volume of a new series on world forestry, in which Weck discusses the chief forest types of the world, their yield potentials and exploitation prospects, the effect thereon of political and social conditions, "development", etc., and their likely future impact on world markets [cf. *F.A.* 21 No. 4756], and Wiebecke presents and discusses German statistical data (largely W. German) on forestry, woodworking and wood-using industries, trade (internal and international, including the implications of the new economic groupings) etc.

5300. SOEST, J. VAN. Oriënterend onderzoek naar kap en verbruik van inlands hout in 1958 en 1959. **[Preliminary study on felling and consumption of home-grown timber in 1958 and 1959.]** *Ned. Bosb. Tijdschr.* 33 (3), 1961 (56–67). [Du.e.]

The data for felling (by species, size of enterprise etc.) and consumption (total, and by species and assortments) for the Netherlands are tabulated.

5301. BUKSHTYNOV [BUKŠTYNOV], A. D. **Forest resources of the U.S.S.R. and the world.** Israel Program for Scientific Translations, Jerusalem. 1960. pp. 65. 23 refs. Price $0.75. Transl. for the National Science Foundation and the U.S. Department of Agriculture by S. Friedman from "Lesnye resursy SSSR i mira" [see *F.A.* 21 No. 5199], and available from the Office of Technical Services, Department of Commerce, Washington.

5302. HEINSDIJK, D. **Interim report to the Government of Brazil on the dry land forests on the tertiary and quaternary south of the Amazon River.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1284, 1960. pp. 110 + 19 gphs., 4 tbls., 1 map. 16 refs.

[Cf. *F.A.* 20 No. 5420.] The report is in six parts: (1) Introduction; (2) Composition of species; (3) Tree diameter distribution; (4) The survey method and its result; (5) Form factors, volume and top-diameter tables; (6) The upper storey of tropical forests.

906. Direct Economic Significance of Forests (Position of Forests and Forestry in the National Economy)

See Nos. 5299, 5318.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116 and No. 5316.

5303. **The case for control of afforestation of open land in National Parks.** Standing Committee on National Parks of the Councils for the Preservation of Rural England and Wales, London. 1961. pp. 24.

Deals mainly with proposed afforestation on Exmoor and Dartmoor.

5304. ANDERSON, M. L. **Tree planting in the National Parks.** *Nature, Lond.* 190 (4775), 1961 (496–7).

A review of "The case for control of afforestation of open land in National Parks" [see preceding abstract].

5305. **Yarner Wood, Devon.** *Extr.* from *Rep. Nat. Conservancy, Lond. 1959/60*, 1960 (10–3 + 1 photo).

Since the declaration of Yarner Wood as a Nature Reserve, various investigations into different aspects of woodland ecology have been initiated. The flora and soil have been recorded along a series of permanent parallel transects. An increase in numbers of short-tailed field voles (*Microtus agrestis hirtus*) has been noted with the development of the forest planting programme. A breeding colony of pied flycatchers (*Muscicapa hypoleuca*) has been successfully introduced in connexion with research on the height preference of hole-nesting birds. Causes of natural Oak seedling mortality and methods of maintaining seedling growth are being studied. The results of work on woodland rehabilitation, involving planting mixtures of a number of species, have been encouraging. Beech, Hazel and Alder have grown particularly well, Alder reaching a height of 12 ft. in 3 growing seasons on well drained slopes. Sessile Oak and Wych Elm have been less successful. Six miles of rides and ca. 10 acres of firebreaks have been established. [Cf. *F.A.* 18 No. 1616.]

5306. McKelvey, P. J. **Condition assessment of protection forests.** *N.Z. J. For.* 8 (2), 1960 (325–34). 11 refs.

Introduced animals have weakened the precipitation-absorbing and soil-stabilizing indigenous protection forests, causing accelerated erosion and increased flooding. There is a demand from foresters and rangers engaged on animal-control work for simple techniques to enable them to assess objectively the protective efficiency of animal-infested forest in a primary reconnaissance and then, by the response of the vegetation, the effectiveness of their animal-control operations. This paper offers two simple techniques to fill this need. They are tools to be used only until the [New Zealand] Forest and Range Experiment Station has surveyed all important protection catchments and established systems of permanent transects and plots to record vegetation changes comprehensively. *Author's summary.*

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 3970, 4263, 5303–4.

5307. Gorbačev, V. T. Nekotorye voprosy planirovki lesnyh poselkov. **[Some points on the planning of forest settlements.]** *Lesn. Prom.* 1961 (2), (26–8). [Russ.]

Discusses, on the basis of actual examples, the correct settling of workers in forest regions (especially in Siberia), i.e. the numbers and size of settlements, their location as regards each other, permanency, and the rational planning of social services. It is concluded that, with the rapid improvement of roads and transport now taking place in Siberia, the best method is, in general, to concentrate workers in large forest settlements, each of which will be the genuine cultural centre of the surrounding region.

5308. Taylor, J. A. **The maritime uplands of Britain: inventory and prospects.** *Nature, Lond.* 189 (4768), 1961 (872–6). 7 refs.

A general discussion of land use in the western uplands of Britain, covering the competing claims of sheep farming, cattle rearing, forestry, and water conservation, and based on a symposium "Hill climates and land usage, with special reference to the Highland zone of Britain" held at Aberystwyth in March 1960.

5309. Pees, A. Économie forestière de la côte basque dans le cadre de la sociologie rurale: la dévastation de la forêt; les landes incultes (touya); les essais de reboisement. **[The forest economy of the Basque Coast in the context of rural sociology; the devastation of the forest; the uncultivated heaths; experiments in afforestation.]** *Ann. Éc. Eaux For., Nancy* 17 (4), 1960 (379–450 + 1 map). 12 refs. [F.f.e.g.span.]

Gives some account of experiments in afforestation and the difficulties encountered in the conflict of forestry and pastoral interests.

5310. Ker, J. W., Smith, J. H. G., and Little, D. B. **Reforestation needs in the Vancouver forest district.** *Res. Pap. Fac. For. Univ. B.C.* No. 36, 1960. pp. ix + 19. 15 refs.

92. Forest Ownership and Ownership Policy

See also Nos. 4522, 4527–8, 5312–3.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

5311. Schille, C. **Size control program of the Saskatchewan Timber Board.** *Timber of Canada* 22 (2), 1961 (62–7, 101, 103).

The provincial forestry branch, in fixing the annual timber cut, issue exclusive cutting rights for White Spruce and Pine to the Crown-owned Timber Board at specified stumpage rates. The latter contract with ca. 75 operating companies to log, saw and deliver to the Board's 8 planing mills the annual cut of ca. 60 million bd. ft. The Board is responsible for the carrying out of forestry regulations and for efficiency of production. As incentives for the latter it pays bonuses or exacts penalties according as minimum and maximum tolerances for thicknesses and minimums for widths are observed, data being gathered by random sampling. Tables show the sliding scales for special prices, bonuses, and penalties for the years 1959–60 and 1960–61.

94. Other Methods to Implement Forest Policy

5312. Knabe, W. Gemeindewald und Agrarstruktur. **[Communal forests, and the structure of agriculture in Nordrhein-Westfalen.]** *Repr.* from *Gemeinde, Bad Godesberg* 1961 (2), (31–5). 14 refs. [G.]

Discusses the contributions that forestry can make to improve agrarian structure [cf. *F.A.* 19 Nos. 2583–4], and in particular the subsidies available under the "Grüne Plan" for afforestation (least for Spruce, most for hardwoods, including Poplars), coppice conversion, separation of forests and pastures, and shelterbelts. Though these are chiefly meant for the family farm, local authorities, churches, etc. are eligible under certain conditions. Subsidies are also available for road-building and for consolidation schemes.

5313. BARRETT, L. I. **Forester reveals blueprint for small forest ownership.** *Timberman* 52 (2), 1961 (42–3, 72). 1 ref.

To help make good the shortage of forest products predicted for the year 2000 in the *Timber Resource Review*, the U.S. [federal and State] authorities have provisionally allocated $428 million annually (Federal funds 221, State 87, private 120) in a 10-year programme of assistance to private forest owners holding <2500 acres, embracing increased planting, stand and cutting-practice improvement, protection, dedication, acceptance of good practice, acreage grants, graduate and subprofessional services of 2200 and 1000 man-years p.a. respectively, training for 40,000 small independent loggers and processors, vocational training, local committees to co-ordinate public and private forestry, rehabilitation of derelict woodlands, increased supplies of plant material, loans, comprehensive insurance, servicing of forest management/marketing co-operatives, assistance in taxation assessment.

944. Co-operation. Collaboration of Forest Owners

See No. 5296.

945.2. Publicity, Propaganda (including Demonstration Forests)

5314. **International catalogue of films and slides.** [*Publ.*] *4th Sess. FAO/ECE Jt. Comm. Working Tech., Prague 1961* No. *FAO/ECE/LOG*/89, 1961. pp. 1 + 15 + 10.

A catalogue of films and slides suitable for training forest workers.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

5315. ARANGO T., F. Medellín, ciudad universitaria. **[Medellín, University city.]** *Agric. trop., Bogotá* 16 (10), 1960 (630–71). [Span.] A.P.B.

Includes detailed information on the staff and the curriculum of the Facultad de Agronomía and the Instituto Forestal, a centre for training forest officers.

945.4. Research

See also Nos. 4018, 4091, 4778.

5316. **Merlewood Research Station.** *Extr.* from *Rep. Nat. Conservancy, Lond. 1959/60*, 1960 (59–67).

Describes the work of the Merlewood Research Station, Grange-over-Sands, and summarizes the results of woodland research (generally published already) undertaken by the Nature Conservancy since 1953, under the sub-heads: Research on woodlands at Merlewood; Trees and soil; Fauna of soil and litter; Litter decomposition in mull and mor; Faunas of mull and mor; Effect of the fauna on the circulation of soil N; Woodland fungi; Research on effects of past treatment.

95. Forest Taxation

5317. ABETZ, K. Die "General Property Tax" und ihre Bedeutung für den Wald in den U.S.A. **[The "General Property Tax" and its effect on forestry in the U.S.A.]** *Holz-Zbl.* 87 (54), 1961 (799–801). Some refs. [G.]

A general discussion of development, present position, valuation rules, treatment of reforestation and young growth etc. in various states, comparing U.S. with W. German conditions. The main conclusion is that taxes based on market value are incompatible with sustained-yield forestry.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See No. 5307.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also Nos. 4270–1.

5318. **Report of the Fifth FAO Regional Conference for the Near East, Teheran, Iran, 21 September–1 October 1960.** FAO, Rome. 1961. pp. 77.

Includes a section on the status of forestry and forest industries in the region, and their potential contribution towards economic development.

5319. **Report of the fifth session of the Asia-Pacific Forestry Commission, New Delhi, 12–18 February 1960.** FAO, Rome. No. *FAO/APFC*-60/15.1 (Rev. 1) 1960. pp. ii + 103. [E.] Limited distribution.

Includes reviews of national progress reports and of subsidiary Commission bodies, a list of documents, and, as appendixes, reports of various *ad hoc* bodies and the subcommittees on *Pinus* and *Eucalyptus*, and on silvicultural systems for lowland tropical rain forest.

FORESTRY THE WORLD OVER

References: 1. *Allgemeine Forstzeitschrift*, Munich; 2. *American Forests*, Washington; 3. *Cornell Plantations*, Ithaca, N.Y.; 4. *Country Landowner*, London; 5. *Daily Telegraph*, London; 6. *Forest Log*, Salem, Ore.; 7. *Forest Products Journal*, Madison; 8. *Forestry Adviser's Newsletter*, Colonial Office, London; 9. *Forêt*, Neuchâtel; 10. *Forêt-Conservation*, Quebec; 11. *Forst- und Holzwirt*, Hanover; 12. *Holz-Kurier*, Vienna; 13. *Holz-Zentralblatt*, Stuttgart; 14. *India News*, London; 15. *Nature*, London; 16. *Norsk Skogbruk*, Oslo; 17. *Pakistan J. For.*, Abbottabad; 18. *Press Release*, Los Angeles; 19. *Research News*, Ottawa; 20. *Soviet Weekly*, London; 21. *Tappi*, Easton, Pa.; 22. *Topola*, Belgrade; 23. *Trees Magazine*, Ohio; 24. *Unesco-Sasco Bulletin*, New Delhi; 25. *Woodworking Industry*, London.

Conferences

The first International Conference on Timber Engineering was held at the University of Southampton from 18th to 23rd Sept. 1961, organized jointly by the University and the T.D.A. Papers were to be presented under the main heads: description, construction, design and research; economics of timber roofing; international developments in the design and construction of timber shells and folded plates; methods of jointing and testing timber roof structures (**7**; July 1961).

A symposium is to be held in 1962, under the auspices of the National Academy of Sciences, Allahabad, India, on "Evaluation of tropical habitat for production of food, fodder, fuel, and fertilizers". Among the subjects on which papers are invited are: Forest habitat for regeneration, growth and development of suitable species of trees; Mangrove habitat and its economic exploitation; The effect on the ecosystem of planting Teak, Sal, conifers etc. outside their natural habitat; The effect of planting *Cryptomeria*, *Casuarina*, Wattles, *Eucalyptus* etc. in different countries as exotics (**24**; July 1961).

Austria. The Österreichische Stickstoffwerke, Linz, have introduced "Kerfex-Nebel", a preparation that generates insecticidal smoke for the control of *Adelges nüsslini* and other forest pests. It is sold in small plastic containers that are ignited by means of a special non-flaming safety match. Ten such containers, holding 250 g. each, are enough to treat 1 ha. (**1**; 8.7.61).

Canada. Six big newsprint companies operating in Manitoba have organized a private air-force to combat forest fires. They have purchased 4 Martin Mars flying boats, retired by the navy 3 years ago, which will be used in water-bombing incipient forest fires. Each is capable of dropping a 7800-gal. blanket of water on forest fires. The water cargo, weighing 32 tons, falls from a height and is sufficient to extinguish a small fire, or control its spread until ground crews can reach it. The flying boats are fitted with scoops, so that after the water load has been dropped, the pilot has only to go to the nearest body of water, scoop up another load, and return to the fire (**23**; May/June 1961).

During recent tests on laminated beams at the Vancouver Laboratory of the Forest Products Research Branch, a microphone was attached to the beam undergoing test and connected to an amplifier and speaker system. Sounds picked up by the microphone were used as a guide in estimating the moment of final failure, so that photographs could be taken of the beam immediately before failure. It is possible that greater use might be made of the sounds generated by wood under stress, as a warning of overload or failure, if more were known about them. In further research at Ottawa, tape recordings are being made of the sounds produced in wood specimens while they are being tested to failure; these recordings are analysed to determine how the occurrence, intensity, and frequency of the sounds change as stress increases and failure is approached (**19**; 15.6.61).

Work in progress at Ontario Research Foundation, Toronto, has shown that an extract from Spruce bark can be used to replace, or be mixed with, conventional vegetable tanning agents, such as Wattle or Quebracho, in leather production, thus promising a useful outlet for a material which has hitherto been considered a waste product of the pulp and paper industry (**21**; July 1961).

France. Decorative panels, made of wood 2 mm. thick, which can be stuck straight on to a wall with a neoprene adhesive, have been shown at the building exhibition 'Expomat 61' in Paris. They are available in 16 different woods (**9**; August 1961).

Oak parquet flooring was among the best of 20 types of flooring tested in a Paris Métro station. After 15 months of use, with 100,000 passengers passing daily, abrasion through wear was <1 mm. and no defects were apparent (**12**; 24.8.61).

Germany. In recent tests in Germany, *Eucalyptus niphophila* and *E. perriniana* suffered little or no frost damage, and withstood a fortnight's cold spell with a minimum of −16° C. In earlier tests, except for the roots of *E. rostrata*, none of 12 species had survived a German winter [cf. *F.A.* 19 No. 4056] (**11**; 17.6.61).

Great Britain. A dense scrub "jungle" is to be planted on 100 acres of Salisbury Plain near Warminster, to provide a training ground for the army. A jungle-type area is required to provide practice in firing for the Small Arms Wing, which is to be moved from Hythe in 1964–65. It is proposed to plant more than a million trees and shrubs (Scots Pine, Privet, Hawthorn, and Beech) at 2-ft. spacing. Planting will begin in October and be completed by Christmas. None is to be allowed to grow more than 10 ft. high (**5**; 17.7.61).

The Nature Conservancy and the Yorkshire Naturalists' Trust have agreed to conserve Askham Bog, a 100-acre remnant of a swamp that must at one time have covered much of the Vale of York. Now almost covered by a thicket of Birch, Oak, and Alder, the bog illustrates the later stages in the succession from open fen to woodland (**15**; 24.6.61).

Work will shortly be started on a 33-acre factory at Thetford, where Novoboard (U.K.) Ltd. will integrate sawmilling plant with a particle-board factory. This type of product, using offcuts from the mills as well as woodland thinnings, is already being made in Europe and America as Novopan and Novoply. Formed by bonding particles and flakes of timber together with a synthetic resin glue, it follows the "triple sandwich" idea developed in Switzerland; the outer layers (using smaller flakes) being laminated to an inner core of larger particles. Thetford, one of the L.C.C.'s overspill towns, was selected as the location because labour and housing should present no problem; more important still, the 36,500 acres of Forestry Commission plantations in Thetford Chase provides an abundant supply of raw material (**4**; August 1961).

R. M. Turner & Hunters Ltd., Aldermaston, have introduced a novel way of protecting their stacked timber from rain and sun by means of stack covers consisting of 500-gauge black polythene film and wire mesh mounted on a wooden frame. A sheet of film is stretched over and stapled to a rectangular frame which is gabled to allow rain to run off. Chicken wire is placed over the sheet and stapled to the sides of the frame, and the complete cover is then battened down with wire to the sides of the stack. Waterproof and rot-proof, the covers afford quick and easy access to the stack and good protection, at the same time allowing air seasoning to continue unimpeded (**25**; July 1961).

India. It is proposed to set up an All-India Institute of Soil Pedology during the Third Five-Year-Plan period. The Government of India have provided £450,000 for the purpose. It is hoped also to obtain $600,000 from the U.N. Special Fund, for purchasing the necessary equipment from abroad. The institute, which will probably be situated at Nagpur, will survey and appraise the soil resources of India and provide essential information on soils to serve as a basis for agricultural development projects. It will also intensify and co-ordinate the fundamental and applied research being done at various institutes and universities in India (**14**; 24.6.61).

Jugoslavia. The successful entries in the 44th competition of the Jugoslav General Investment Bank, for loans for the establishment of intensive plantations of quick-growing species, were approved on Dec. 6, 1960. For the first time, Poplar is predominant. Of 87 projects entered—the competition is open to political-geographical units (people's councils), forestry and agricultural organizations, and wood-using enterprises—36 were approved, and of these, 30 were for Poplar (a total of 23,567 ha.) and 6 for conifers (1453 ha.). The plantations are to be established by 1962, the loans being at 2% p.a. interest and repayable in 15 years for Poplar and 20 for conifers (**22**; Jan.–Feb. 1961).

Norway. A gift of one million kroner from Norway to Iceland is to be used to create a fund to finance co-operation between the two countries in planting forests in Iceland. It is an expression of Norwegian gratitude for Icelandic help during the last war (**16**; June 1961).

Sweden. A phytotron (a laboratory for studying the growth of plants under scientifically controlled conditions) is to be built at the State Institute of Forestry Research in Stockholm. It will be the second of its kind in the world, modelled on that at Pasadena, California. It will contain a series of rooms in which various climatic conditions can be simulated, with facilities for varying the temperature from +30° to −25° C., and the humidity from 8 to 98%. By artificially speeding up the change of 'seasons', or extending the length of 'summer', it will be possible to make a tree grow 5–10 times the height it would attain in a year in normal conditions. All plants are to be grown in beds that can be moved from one room to another (**23**; May/June 1961).

When the 1400-ton Swedish flagship Wasa was recently brought to the surface from the bottom of Stockholm harbour, where it had lain undisturbed since its loss with all hands in 1628, its hull, made entirely of Oak, was found to be completely sound, thanks to the preservative action of the clayey mud and the low salt content of the harbour (preventing marine borer attack). To prevent it from falling to pieces on drying out, it is planned to slow down the drying by the use of water sprays and plastic coverings, and later to treat it with glycerine and linseed oil to improve dimensional stability. Figureheads, carvings etc., are to be treated with polyethylene glycol (**13**; 11.8.61).

U.S.A. When Joyce Kilmer wrote his poem 'Trees' ("I think that I shall never see A poem lovely as a tree" . . .) as an undergraduate at Rutgers University, he immortalized a massive Oak on the campus there. Thus there was dismay at Rutgers this spring when some of the branches on the Kilmer Oak failed to flush. Word got about that the tree was dying at the advanced age of 300 plus. Major surgery to prolong its life was indicated. The free services of a firm of tree experts were offered and promptly accepted. The tree is no midget: 10 years ago it was 68 ft. high and 54 in. in diameter, with a crown spread of 108 ft. Meanwhile the Student Forestry Club at the University has launched a project to perpetuate the Kilmer Oak tradition. Three small Oaks from acorns from the famous tree are growing well on the campus, and 7 more seedlings are getting special care in a greenhouse (**2**; Aug. 1961).

The National Geographic Society, which sends expeditions all over the world, has discovered a geological treasure in its own back yard. Excavations on the site of the society's new headquarters in Washington have revealed a grove of giant Bald Cypresses that grew in a pre-Ice Age swamp (**5**; 17.7.61).

A machine for measuring the health of trees is in use at the University of Washington. It measures the CO_2 content at 6 different positions in a tree simultaneously, which gives a measure of the biochemical efficiency of the tree (**10**; May–June 1961).

Pumping equipment constructed by the Oregon State Forestry Department's workshops for the specific purpose of ground application of the fire retardant, alginated water [see *F.A.* 22 p. 161], was publicly tested on June 1–2. The equipment performed satisfactorily, though some difficulties were encountered when the algin powder was introduced into a full tank of water. Injecting the powder into a tank half full of water and then filling up corrected this fault. The pumping apparatus consists of two tanks with independent pumping equipment. The larger tank for the algin mix holds 400 gal., while the smaller, holding 27½ gal., is for the $CaCl_2$ solution which, when joined to the algin mix at the spray nozzle, causes the algin to take on the jelling characteristic (**6**; July 1961).

Cloud pictures taken by the recently orbited weather satellite—Tiros III—and transmitted in the form of schematic drawings through the national facsimile circuits are being received regularly by the Salem weather office of the Oregon State Forestry Department. The drawings, which depict the cloud patterns and characteristics, are used to supplement other weather data in preparing the forecasts [**6**; Aug. 1961].

A population of woodchucks at the Cornell Rose Garden is being studied by giving each woodchuck a small radio transmitter with a unique radio frequency that identifies that particular animal. By running a wire from the recording room to a pick-up antenna at each woodchuck burrow, and listening at all burrows every few minutes, the movements of each individual can be traced. The problem of attaching the tiny low-frequency transmitters to the animals, which are virtually neckless, must be able to run unimpeded along the burrows, and have very sharp teeth, was overcome by surgical insertion of the transmitter under the skin above the shoulder. Animals examined a year after this treatment showed no ill effects. The monitoring of each hole, with a six-second listening period at each, is performed day and night by an instrument that translates the signals it receives into punched code on paper tape. The system appears to be able to record almost all important events in the Rose Garden woodchuck population. A woodchuck's whereabouts can be checked many times an hour without its being disturbed, which of course is impossible by methods such as live trapping and ear-tagging (**3**; Spring 1961).

A chemical that can "put a tree to sleep" promises help to Citrus growers in areas like Florida that are threatened yearly with frosts, according to the U.S. Rubber Company. The firm reports development of a chemical growth regulator, called MH-30, that puts trees into a state of temporary dormancy in which they can withstand lower temperatures (**17**; Oct. 1960).

Among items of forestry equipment and machinery exhibited at the 5th World Forestry Congress in

Seattle was a type of waterproofed paper, suitable for note-books, field record sheets, etc. The paper is of particular interest to tropical foresters, as it can be used in pouring rain, even a hard pencil leaving a clear hard mark. Days of sitting in camp because the rain would reduce field note-books to pulp can now become a thing of the past. The makers are J. L. Darling Corp., Browns Point, Tacoma, Wash. (**8**; March 1961).

McCulloch International Inc., Los Angeles, have introduced what is claimed to be a revolutionary new power tool, developed in conjunction with the U.S. Forest Service Equipment Division. Called the 'ROTO-BIT pruner', the tool features a rotating cutter-bit actuated by a shaft connected to a chain-saw engine through a long aluminium pole. The operator can reach limbs up to 16 ft. or more from the ground. Limbs up to 4 in. in diam. can be pruned in ca. 4 seconds. The ROTO-BIT, which resembles a standard drilling bit, is made of high steel alloy, and is not only long-lasting but designed for easy sharpening. It is guided into the limb by an adjustable gauge which is an integral part of the pruner head. Turning clockwise at 6000 r.p.m., the bit 'planes' through the bark into the cambium and out again, making a swift concave cut. This planing action results in 'shaved' wood fibres which reduce bleeding, retard infestation, and encourage the tree to heal quickly. Total weight of the ROTO-BIT pruner, attached to its harness, is 29 lb. with a 6-ft. pole and 31 lb. with a 12-ft. pole (**18**; 22.5.61).

U.S.S.R. A 4000-h.p. floating timber-harvester will tackle its first major task in felling and clearing timber from the beds of the man-made seas created by hydro-electric dams in Siberia [cf. *F.A.* 21 p. 334]. The machine displaces 1600 tons, and can clear trees and undergrowth from areas under 3–20 ft. of water. The machine fells the trees, strips off bark and branches, cross-cuts the stems into required lengths, bundles them, and returns them to the water, where they are easily marshalled into rafts. It also chips the waste wood for the pulp and paper industries, and can tow behind it floating workshops for the manufacture of chipboard, etc. It is manned by a crew of 110—adequate to keep it working round the clock on a three-shift basis (**20**; 31.8.61).

FORESTRY COMMISSION PUBLICATIONS

Describe the progress of forestry in Great Britain and present the results of research work. Publication List No. 31, also booklets "Grants for Woodland Owners", "Forestry in England", "Forestry in Scotland" and "Forestry in Wales" are available free from Secretary, Forestry Commission, 25 Savile Row, London, W.1.

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